



FRIDAY, JANUARY 10, 1902.

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Accident Record—Correction.

In our record of train accidents in November, which was published Dec. 20, page 876, there appears to be an error. The third paragraph says that there was a collision at Middletown, Ind., on the Pittsburgh, Cincinnati, Chicago & St. Louis, in which an engineman was fatally injured. An officer of the road writes us that there was no such accident.

Contributions

Cleanliness in Sleeping Cars.

TO THE EDITOR OF THE RAILROAD GAZETTE.

There is now in quite extensive use on sleeping cars in England a little improvement which adds materially to the comfort of traveling, viz.: The lengthening of the sheets about two feet and turning one end over the outside of the blanket and fastening with buttons. This makes it possible to avoid coming in contact with the blanket. In view of the many complaints of the unsanitary condition of sleeping car blankets in this country, the change would, I think, be appreciated here.

E. F. P.

Electric Headlights in Butting Collisions.

Chicago, Dec. 31, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In your issue of Dec. 6 there appears an article regarding the collision of fast trains at Franconia, Ariz., on the Atchison, Topeka & Santa Fe, and the article concludes with this statement, viz.:

"Both trains had electric headlights, but it is stated that a curve in the line, with low sand hills at one side, obscured the view."

We intended calling your attention to this error in your article immediately upon reading it, but waited to hear from the officials of the railroad in order to be sure our statement would be correct. The fact is that only one of the locomotives was equipped with an electric headlight. We always have claimed, and do still claim, that head-on collisions, either on straight or crooked roads, are practically impossible where both locomotives are equipped with electric headlights.

PLYLE-NATIONAL ELECTRIC HEADLIGHT CO.,
R. C. VILAS, President.

The Locomotive Whistle.

Paterson, N. J., Dec. 11, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In recent numbers of the *Railroad Gazette* I have noticed communications regarding excessive whistling of locomotives, one of which elicited a suggestion that for ordinary purposes the whistle valve should be but half opened, which struck me as an excellent idea, if it were only practicable. In actual practice, however, the ordinary valve is not susceptible of careful grading without more care and attention being given to it by the engineer than the average man is likely to give.

I have seen descriptions of a double fulcrum arrangement for throttle levers which made it possible for the engineer to open the throttle very gradually when starting the locomotive, with great ease, the lever at first working on a fulcrum very close to the throttle rod; as

the valve reaches a certain fraction of its full opening, the second fulcrum comes in play, and, being located at the same point as the fulcrum of the ordinary lever, requires the usual amount of force to open the valve further. Why could not the same arrangement be applied to the whistle valve lever, making it open half way with considerable ease, and requiring a heavier pull for full opening than is now necessary with the ordinary arrangement.

A. C. COWLES.

A Layman's Views on "The Smoke Nuisance."

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have been greatly interested in the article contributed by Supervising Engineer Benjamin, which appeared in your issue of Dec. 20, regarding the efforts of railroad officers to abate the smoke nuisance in locomotive operation. Any system of abatement which is dependent entirely upon the care and watchfulness of the fireman, especially when he is worked to the limit of endurance, seems impracticable. Mr. Benjamin admits the inefficiency of the methods undertaken by saying that "eternal vigilance is the price of success," and that "if the inspections were to be relaxed for a month there would be a gradual subsidence to the old conditions." To be effective that feature which places the responsibility upon one man's unremitting care must be eliminated from the remedial methods. According to my way of thinking the "one-shovel system" of firing is defective for the reason that the frequent opening of the furnace door, with its necessary admission of cold air, keeps the temperature in the fire-box too low to insure the very results aimed at. The object to be attained should be to consume the smoke, not to prevent it. The only practical solution is the adoption of some method which permits a locomotive to be fired without opening the door, so that the proper degree of heat in the fire-box shall be obtained to ignite and burn up the rich carbons and volatile gases which "go up in smoke" because of the low temperature resulting from present methods of firing.

With this in mind I was interested in a descriptive article I read recently concerning a mechanical stoker, which an engineer, John W. Kincaid, has invented and perfected. The principles upon which this machine has been constructed strike me as being in the direct line of reasoning I have advanced; it fires a locomotive without opening the door, is wholly practicable and efficient. The report referred to said that in addition to effecting a saving in fuel, the stoker "practically abated the smoke and spark nuisance."

A. S. BURROUGHS.

The Power of Locomotives As Affected by Improved Valve Gears.*

An appreciation of the importance of the mean effective pressure as a factor in the power of a locomotive has often led to the adoption of devices which appear to be advantageous, but which in fact are not so. Thus, a change in the proportions or setting of slide valves may result in an increased mean effective pressure for a given position of the reverse lever, and the argument is advanced that the power has been increased. Again, modifications in valve gear may result in "filling out the card"; that is, in straightening the steam line, in squaring the corners and in giving withal an increased mean effective pressure, and because the mean effective pressure is increased, it is often argued that the power is increased. In fact, any change which may result in an enlarged card for a given position of the reverse lever is likely to be brought forward as evidence of an increased power. But such evidence is not conclusive. A detail which accomplishes no more than an increase of the mean effective pressure for a given position of the reverse lever, accomplishes nothing which might not have been more easily attained by its omission, and by merely advancing the reverse lever on its quadrant. For speeds which are sufficiently high to permit the adhesion of the drivers to absorb the full power of the cylinders, the maximum power depends upon the boiler capacity and upon the efficiency of the engines, and upon nothing else. Whatever may contribute to enlarging the steaming capacity of the boiler, contributes to an increase of power, and whatever operates to reduce the consumption of steam per unit of power developed, will extend the limit of maximum power. The real test, therefore, which should be applied to every detail which is assumed to increase the cylinder power of a locomotive, concerns its effect upon the steam consumption of the engine. Will its use produce a horse power upon the expenditure of less steam than the device which it supersedes? If it will, then, when the boiler is supplying all the steam it can make, it will permit the cylinders to deliver more power than they were able to do without it. If it does not increase the efficiency of the cylinder action, it can not really increase the power.

This suggests the inquiry as to whether the distribution of steam in the cylinders of simple engines is satisfactory; whether, for example, we ought to persist in efforts to secure square-cornered cards. The reply is that in most cases where the gear is sufficiently heavy and stiff to do the work for which it is designed, the distribution as obtained from present gears is satisfactory. The typical locomotive card, displaying the wire

*An abstract from a paper on "Some Factors Affecting the Power of Locomotives," read before the New England Railroad Club, December, 1901, by W. F. M. Goss, Dean of the Schools of Engineering, Purdue University.

drawing action throughout the cycle, which, especially at high speed, is strongly marked, is, after all, a card of high efficiency. The steam consumption of the locomotive is less than that of most other forms of high-speed steam engines employing atmosphere exhaust. Even when the speed is increased to limits which far outstrip those common to stationary types of engines, its work is to be regarded as highly efficient. So well do the better class of valve gears which are now in common use perform their work, that any one who attempts to increase the power of a modern locomotive by improving its steam distribution, will find but a narrow margin upon which to work. On the other hand, it should be equally evident that the adoption of compound cylinders, or of provisions for the use of superheated steam, are matters which, if well worked out in detail, can not fail to effect economy in the use of steam, and, as a consequence, to raise the limit of maximum power.

Railroad Presidents' Expectations for 1902.

[From interviews in the New York Evening Post.]

E. P. Ripley, Atchison, Topeka & Santa Fe.—The outlook for 1902 shows few clouds in the horizon, and, except in the case of roads whose income depends largely on the corn crop, the prospect for large earnings is good. I wish I could say that progress had been made toward securing permanent stability of rates, but quite the contrary is the case, and I can see no probability of improvement under existing laws. The Interstate Commerce Law constitutes the greatest barrier to the establishment of conditions fair alike to the carriers and their patrons. Framed by theorists and novices, ignorant of the questions with which they were dealing, and blinded by prejudice, it has been the cause of bringing about the very troubles it was intended to cure, and in a vastly more aggravated form—it has benefited no one, and has injured thousands. It should be repealed wholly, or shorn of its absurdities and inconsistencies. From every standpoint, whether that of public or that of the shareholder, the railroads should be permitted to make legally enforceable agreements for maintaining rates. This should be encouraged instead of being forbidden.

"I believe the railroads have done all that could be expected of them in raising additional capital for equipment and general facilities. They have certainly come much nearer to meeting the extraordinary demands upon them than have the manufacturers. You cannot place an order for steel rails or any important piece of machinery with any hope of delivery under six months from date, but there are few places in the country where you would be called on to wait more than a few days for a car in which to ship your order."

O. D. Ashley, Wabash.—"To anticipate a continuance of the gains of the last two or three years through another year would be perhaps an over-sanguine expectation. As a matter of fact, if the gross earnings of the ensuing year equal those of 1901, it will be a very satisfactory record. It is safer, upon the whole, to look for a decrease in gross traffic."

"Rates have apparently been fairly well maintained on the so-called 'trunk lines,' but in the Northwest and on lines west of the Mississippi River there is still considerable trouble and irregularity. The 'community-of-interest' policy, so far as its influence extends, has undoubtedly had a good effect in maintaining established rates, but it has not yet acquired sufficient control to dominate the entire situation. The undertaking embraced in the policy is too vast to be accomplished at once, but in process of time the acquisition of competing lines will necessarily bring those lines under the control of the proprietary interest, and naturally bring rate wars to a conclusion. In the extension of this policy the danger may be in the payment of too high a price for control. Legalized pooling would, in my judgment, be the safest and best remedy for the rate-cutting evil. Supervision on the part of the Interstate Commission should not, however, mean the dictation of rates, but approval or disapproval, to be finally settled by the courts if the parties cannot agree."

Roswell Miller, Chicago, Milwaukee & St. Paul.—"I do not anticipate that the railroads in general will record much increase in tonnage and revenue over last year, but I do not look for a decided decrease."

"No material progress has been made towards securing permanent stability of rates. Rates on competitive traffic are about as low as they can go. Legislation which will permit pooling and contracts between roads will be of advantage, although it will not wholly correct existing evils. The most that can be hoped for under present conditions is maintenance of rates in what is called 'local territory'—which is pretty well observed in the West; and temporary improvement of rates in various competitive territories—which improvement will necessarily be only temporary. Railroad betterments are likely to continue as large during the coming year as in the last few years; and large purchases of heavier engines and additional cars will continue for the coming year."

"I consider the most needed reform in railroad administration to be confidence on the part of the management of roads in each other, so that when they agree to maintain rates absolutely they will maintain them. I am free to say, however, that I do not look for this to prevail among railroads, any more than it does in other classes of business where the same evils exist."

"I do not think the railroad consolidations are likely

to accomplish any good results, as long as the laws of the different States prevent the consolidation of competing and parallel lines. The consolidation of competing and parallel lines is the only consolidation that can do railroads any good. As far as my observation goes, the community of interest has resulted only in greatly increasing the capitalization of various roads, the effect of which remains to be seen. If the roads can earn dividends on the large capitalization it will bring legislation for reduced rates and increased taxation."

Joseph Ramsey, Jr., Wabash.—"I do not anticipate any decrease in tonnage during the next year. I would, however, anticipate an increase in the revenues, even with the same tonnage, as compared with the year 1901. While the condition of rates has not been satisfactory during the present year, a very material improvement is anticipated by all hands after January 1, 1902. Material progress has been made toward securing permanent stability of rates. Hundreds of thousands of cars of large capacity have been built, not so much on account of the demands of increased traffic as on account of the necessity of reducing the cost of operation. Should the per diem plan be adopted in place of mileage for the use of cars, the present freight car equipment would practically be increased in its capacity, due to the better movement of the cars."

Charles S. Mellen, Northern Pacific.—"With the tide of immigration pouring into the territory served by our lines, and the great inquiry for lands by settlers of small

"As to the ultimate effect of the railroad consolidations and 'community-of-interest' theory of railroad finance, a gentleman prominently connected with a Western road, in discussing this subject, summed it all up in the following words: "The 'community-of-interest' plan of handling the railroad properties of the country is all right, and will prove satisfactory so long as it is for the interest of the community." It would seem as though this remark about covers the case, and that the new plan will work out all right if the railroad properties of the country are handled under it wisely and judiciously, and with the view and result of performing the transportation service of the country more cheaply and at least as efficiently as in the past."

M. E. Ingalls, Cleveland, Cincinnati, Chicago & St. Louis.—"I should think we were on the top wave of tonnage and revenues, and that we would be fortunate if from now on we were able to hold the present basis. Some roads may decrease, and some increase, but if the general average can be kept up, we will be fortunate."

"The future needs of railroads are (first) such legislation as will give them authority to make contracts among themselves for the maintenance of tariffs for profitably conducting interchange of business; and (second) the railroad officials themselves must be educated to the fact that transportation means money; that the giving of it away is giving away money. Free transportation must be lessened, and the respect for tariffs must be

L. G. Haas, in the *Railroad Gazette* of March 1, 1895, has been tried and is in use on a portion of the Pennsylvania Lines. A number of the various methods in use for rating locomotives were described by Mr. L. R. Pomeroy, in a paper read before the New York Railroad Club, Jan. 20, 1898. As the method above referred to differs somewhat from those described by Mr. Pomeroy, the following is given for comparison:

The method is, in brief, the introduction of a car allowance factor for the purpose of making an adjustment for empty and loaded cars. This factor is determined by dividing the difference in the maximum weight of a train of loaded cars and a train of empty cars, that can be hauled over the division for which the ratings are to be made, by the difference in the number of cars. The figure thus obtained is added to the weight of each car, whether loaded or empty. With this adjustment added, it will be found that the adjusted tonnage of the train will be the same whether it consists of loaded or empty cars and that the work done, or drawbar pull, will be the same in each case. For example:

Let C = Car allowance factor.
 W_L = Weight of train of loaded cars.
 W_E = Weight of train of empty cars.
 N_L = Number of loaded cars.
 N_E = Number of empty cars.

$$\text{Then } C = \frac{W_L - W_E}{N_L - N_E}$$

Or, on a given division a Class "A" locomotive can haul, at approximately the same speed between termini, 20

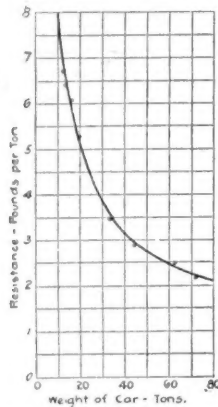


Fig. 1.—Actual Resistance of Freight Cars at Speeds Between 17 and 25 Miles an Hour.

$$C = \frac{W_L - W_E}{N_L - N_E}$$

$$N_L = \frac{W_L}{W_L}$$

$$N_E = \frac{W_E}{W_E}$$

$$W_L = \frac{W_L}{T}$$

$$W_E = \frac{W_E}{T}$$

$$W_L = \frac{W_L}{R_E}$$

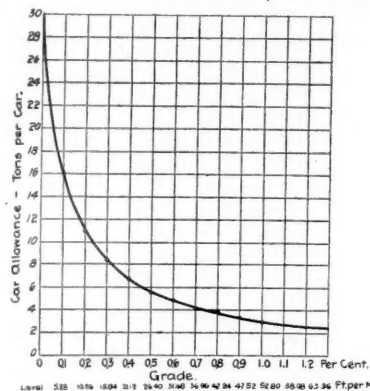


Fig. 2.—Method of Determining Car Allowance Factor for Freight Trains.

C = Car Allowance—Tons per Car.
 T = Tractive Power of Locomotive = 21,500 lbs. H 2.
 R_L = Resistance Coef. Loaded Cars = 4 lbs. per ton.
 R_E = Resistance Coef. Empty Cars = 7 lbs. per ton.
 W_L = Average Weight Loaded Cars = 42 tons.
 W_E = Average Weight Empty Cars = 15 tons.
 W_L = Total Weight Loaded Cars, tons.
 W_E = Total Weight Empty Cars, tons.
 N_L = Number of Loaded Cars in Train.
 N_E = Number of Empty Cars in Train.

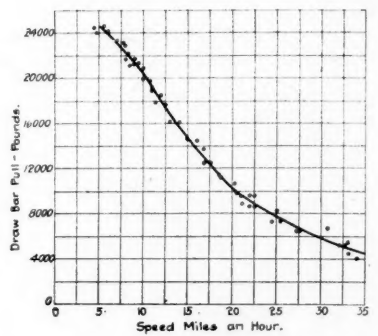


Fig. 3.—Drawbar Pull at Various Speeds of Engine No. 418—Class H 3c.

means, I see no reason why further increases in tonnage and revenue will not continue, always barring the fact that our road is dependent in large measure upon the wheat crops, and it is yet too early to make predictions regarding next season's returns in this respect."

W. H. Truesdale, Delaware, Lackawanna & Western.—"The coming year seems likely to make a new record of business growth and industrial activity, which is the most promising and auspicious feature of the railroad situation at this time. No material progress has been made, so far as is apparent, in securing the permanent stability of rates, and if there should be a marked decrease in the tonnage offering, rates are likely to also show a decline. A closer co-operation on the part of the financial interests owning and controlling the railroads of the country can best accomplish a substantial maintenance of rates, but it is questionable whether it is possible to bring this about by any legislation, either the passage of a 'pooling bill,' so called, or other measures. Should Congress see fit to pass a bill authorizing the making of enforceable contracts between railroads for pooling their revenue on competitive traffic, the rates charged thereon being subject to the supervision of the Interstate Commerce Commission, it is difficult to see wherein the public interests would be prejudiced thereby."

"Legislation that would require the railroads on demand of the Interstate Commerce Commission to report to it all concessions from regular published tariff rates during any given period, and requiring accounting officers to verify same under oath, would unquestionably result in a better maintenance of rates, and prove of benefit to the public and railroads generally."

"The railroads are short of motive power and modern convenient facilities at large terminal points for quickly and cheaply handling their freight."

"There is no reform which will be more satisfactory in its results than a radical change in the existing practice as respects the interchange of cars between one another, coupled with facilities at terminal points, which will relieve cars from excessive delays there."

"Railroad betterments are likely to continue on a very large scale in the future as heretofore, likewise the purchase of new and heavier equipment. This is necessary if the railroads are to keep pace with the natural growth of the country and its commerce, and no one will question for a moment but what they will do this in the future as they have done in the past."

increased. In other words, the great reform that is needed is to have our employees and shippers educated to the idea that the tariff cannot be disturbed except by a vote of the directors, precisely as the rate of dividend is settled by them. When this is done we will have more revenue, less trouble, the public will be better satisfied and better served, and the securities of railroads will offer a better investment."

Thomas P. Fowler, New York, Ontario & Western.—"The volume of traffic offered and in sight, far exceeds the ability of the railroads to handle and to provide equipment for adequately. The railroads are likely to record further increases in tonnage and revenues during the year, and some progress has been made towards securing permanent stability of rates. Pooling or legislation granting supervision over rates to a Government Commission is not advisable, either from the point of view of the railroads or the public. The cost of moving freight will continue to decrease as roadbeds are strengthened and improved for heavier engines and cars. To this end railroad improvements must continue as in recent years, and purchases of additional cars and locomotives must be kept up. Reform in railroad accounting is most desirable, particularly towards securing uniformity, and the reports in the various States should conform to Interstate Commerce Commission forms of accounting to secure such uniformity."

An Adjusted Tonnage Method for Rating Locomotives.

At the December meeting of the Western Railway Club, Mr. D. F. Crawford, Superintendent of Motive Power of the Pennsylvania Lines West of Pittsburgh, read an interesting paper on locomotive rating, describing the method used on that road for rating locomotives on an adjusted tonnage basis. We have added to the extracts from Mr. Crawford's paper some further explanation of the application of this method received from him by correspondence.

Since the practice of loading locomotives on a tonnage, instead of a car, basis, was introduced, many suggestions have been offered as to a proper allowance to be made for empty or partially loaded cars, so that a rating of a given class of locomotive would be uniform, whether the train consisted of loaded, partially loaded, empty cars, or a proportion of each. The method proposed by Mr.

loaded cars, weighing with lading 43 tons each, or 50 empty cars, each weighing 13 tons. Then, $(860 - 650) \div (50 - 20) = 7$. Under these conditions the locomotive rating would be 1,000 adjusted tons, determined as follows:

$$W_L + N_L C = 860 + (20 \times 7) = 1,000$$

$$W_E + N_E C = 650 + (50 \times 7) = 1,000$$

For a mixed train:

$$\begin{aligned} 5 \text{ loads (43 tons each)} &= 215 + (5 \times 7) \\ 10 \text{ " (20 " " ")} &= 200 + (10 \times 7) \\ 24 \text{ empty (13 " " ")} &= 312 + (24 \times 7) \end{aligned} \quad \left. \vphantom{\begin{aligned} 5 \text{ loads} \\ 10 \text{ " } \\ 24 \text{ empty} \end{aligned}} \right\} = 1,000$$

The instructions for loading trains with this method are very easily understood, simply stating: "Add seven tons for each car to its weight, including load; give Class 'A' locomotive, 1,000 tons, followed by ratings for other classes of locomotives used on the division." The maximum rating being reduced to meet weather conditions.

The car allowance factor which has been called "resistance" for convenience, varies with the grade, becoming less as the grade increases, on account of the fact that the rolling and journal friction, which determines it, becomes a smaller part of the total resistance; consequently there is a different allowance or adjustment necessary for each ruling grade. It having been observed that the resistance varied in some relation to the weight of the car, tests were made with a dynamometer car to obtain some information on this subject. Fig. 1 shows graphically the results obtained to date. The weight of the cars is laid off on the horizontal scale and the resistance in pounds per ton on the vertical scale; the points on the curve then giving the resistance for any weight of car at ordinary freight train speeds of 15 to 20 miles an hour. Of course, on account of the difficulty in obtaining sufficient information to fully define this curve, but a few points having been located, it can only be considered as being approximate. With this information the curve, Fig. 2, showing the car allowance for different grades, may be readily calculated. On the road referred to the rating of locomotives by the method given has proven very satisfactory. Trains made up entirely of loaded, empty, or loaded and empty cars, making approximately the same time between termini, and under similar weather and engine conditions burning practically the same amount of coal, shows that the locomotive rating is uniform notwithstanding the variations in the weight and number of cars. Of course, the adjustment

figure, or paper tonnage as it has been called, enters into the rating figures only.

Hauling Capacity of Locomotives—Slow Freight.									
Allegany—W. Loudonville.					W. Loudonville—Cr'stine.				
Engines.	A	B	C	D	A	B	C	D	
4c H2a, G3.	825	775	700	575	1,150	1,075	975	800	
4c H2, H2a.	875	825	725	600	1,225	1,150	1,025	850	
G 3a, 2c H2.									
H2a.	900	825	750	625	1,275	1,175	1,075	900	
1c H2, H2a.	975	900	825	675	1,375	1,275	1,150	950	
H2a, H3b.	1,050	975	875	725	1,475	1,375	1,250	1,025	
H3c, F1, G4.	1,200	1,125	1,000	850	1,700	1,575	1,425	1,200	
H 4.	1,375	1,275	1,150	950	2,350	2,175	1,975	1,650	
G 4a.	1,375	1,275	1,150	950	1,925	1,800	1,625	1,350	
G2, D8a, D9a.									
D 10a.	625	575	525	425	900	825	750	625	
D 9, D 10.									
D 16d.	725	675	600	500	1,025	950	850	725	
D odd.	475	450	400	325	675	625	575	475	
Resistance 7 tons per car. West-bound.					Resistance 7 tons per car. West-bound.				

A sample of the rating sheets issued to Yardmasters and Conductors is shown above. The "A" rating represents the hauling capacity of locomotives under favorable conditions, and must always be used unless instructions to the contrary are issued by the Division Superintendent, who names the rating to be used during a given period. In practice the ratings are used approximately as follows:

Above 40 deg.	A
40 to 20 deg.	B
20 to 10 deg.	C
Below 10 deg.	D

Ratings below "D" are not given, as usually when weather conditions are so severe as to interfere with hauling the "D" rating, trains are run under special orders. The lower ratings are also used for convenience in loading engines in the direction of light traffic, and sometimes on a single line where it is desirable to cover the distance between certain points at a higher rate of speed than permitted by the "A" rating. While no fixed method is used for decreasing the ratings of locomotives about ready to go to shop for general overhauling, the rating for such an engine is reduced by bulletin notice, usually to the next rating below those prevailing. Fast freights and stock trains have separate rating sheets of the same form as given above.

In determining the locomotive ratings and car allowance factors, a number of tests have been made, in fact practically all the ratings have been verified, either by dynamometer tests or by speed records over each division. Tests were made of trains of both loaded and empty cars, so that the car allowance, as well as the locomotive rating, could be checked. When the matter of locomotive rating on the tonnage basis was first considered, an effort was made to use some of the well known resistance formulae. The results obtained by using these formulae could not be verified by dynamometer tests, as the records indicated that the rolling and journal friction remained practically constant at ordinary train speeds. This led to an investigation of the relation of the drawbar pull developed by the locomotive to speed. The result of this investigation for one locomotive is shown in Fig. 3. Prof. Goss has since derived, from the test locomotive at Purdue University, and published a very similar curve. A curve derived in this manner will form a basis for rating at any speed, the locomotive to which it applies. It has been found that ratings based on this information work out very well in practice. Some of the formulae used for ascertaining train resistance at various speeds are based on the indicated horse power, or drawbar pull calculated from it. Comparisons of indicated and dynamometer drawbar pull show that the former is too high, the losses in the locomotive apparently increasing more rapidly than the speed.

In answer to our questions, Mr. Crawford sends us the following explanation of how the car allowance factor is calculated and it may be noted that the ordinates in Fig. 1 are actual resistances determined from dynamometer car records. Mr. Crawford says: We have not attempted to separate that part of the resistance which is independent of the weight of the car from the total resistance. We calculate the car allowance factor (Fig. 2) in accordance with the example below:

Let $T = 21,500$ lbs., drawbar pull.
 $R_L = 4$ lbs. per ton (level track)
 $w_L = 42$ tons.
 $R_E = 7$ lbs. per ton.
 $w_E = 15$ tons.
 Then $W_L = T \div R_L = 21,500 \div 4 = 5,375$ tons.
 $N_L = W_L \div w_L = 5,375 \div 42 = 128$ cars.
 $W_E = T \div R_E = 21,500 \div 7 = 3,071$ tons.
 $N_E = W_E \div w_E = 3,071 \div 15 = 205$ cars.
 $C = (W_L - W_E) \div (N_E - N_L) = (5,375 - 3,071) \div (205 - 128) = 29.9$.

To determine the engine rating from the diagram, Fig. 3, we use the formula

$$W = \frac{T}{R} - w$$

Where W is the weight of train in tons; w the weight of engine and tender in tons; T the tractive power of the locomotive in pounds, and R the train resistance in pounds per ton. Instead of taking the well known formula for train resistance at various speeds and dividing the calculated tractive power of the locomotive by the resistance determined from this formula, we ascertain as closely as possible the average weight of cars to be hauled over the division, and from Fig. 1 obtain the resistance for cars of this weight. From Fig. 3 the available tractive power, at the desired speed, is determined and these quantities are introduced in the formula given above.

The whole idea of the adjusted tonnage method of rating locomotives is to have the locomotive do the same work whether the engine be hauling loaded or with empty cars,

or with a mixed train. In other words, a train loaded on the adjusted basis should make the engine exert the same drawbar pull in pulling the train over the line, without regard to the number and kind of cars.

The Proper Utilization of Motive Power.

In the November issue of the Proceedings of the Southern & Southwestern Railway Club is a paper with the above title by Mr. T. M. R. Talcott, Assistant to the President of the Seaboard Air Line. Below are some extracts from the paper:

Statement of Mileage and Methods Employed:

In order to ascertain the average mileage made by locomotives annually on a number of roads, and how they handled their locomotives, a number of circulars were sent to the heads of Mechanical Departments, and such replies as have been received are abstracted below. Other replies have been promised giving results obtained from pooling, but they have not yet been received.

Chicago, Burlington & Quincy:

Average mileage of locomotives..... 39,641

On main line locomotives are pooled or double crewed and single crewed on branches. We find that there is a manifest advantage in the pooling of engines, as by that method a larger mileage is obtained from the engines, and the interest on the invested capital is practically taken advantage of continually. We do not think it would be practicable to handle our business to advantage in any other way. Pere Marquette Railroad:

Average mileage of locomotives..... 43,722

Passenger engines single crewed. Freight engines on main line double crewed and pooled and single crewed on branches. I much prefer double crewing to pooling. I am not in favor of pooling when it can be avoided.

Missouri Pacific:

Average mileage of locomotives about..... 46,000

On some divisions locomotives are pooled, in other cases double crewed, and where there are few trains they are single crewed. The day of the old plan of single crewing engines has passed on the road where there is any volume of business. In my opinion we can no longer afford to keep a sufficient number of engines to do our business and allow them to make any such mileage as one man can make with them; that is to say, we must get more mileage out of our engines than any one man can make.

Louisville & Nashville:

Average mileage of passenger engines about... 60,000

Average mileage of freight engines about... 45,000

Engines pooled altogether. It would be impossible for us to handle our business with the number of engines we have other than in the manner of the pooling system.

Wabash:

Average mileage of all locomotives..... 30,420

Average mileage of locomotives in service... 39,180

Some locomotives pooled, others double crewed, and some runs single crewed. We work our power in any way possible to make mileage.

Norfolk & Western:

Average mileage of locomotives..... 30,050

Engines, with but few exceptions pooled in freight service, a few passenger engines double crewed, and a small percentage of passenger engines single crewed.

Southern Pacific (Atlantic System):

Average mileage of locomotives..... 39,960

We pool our engines, passenger and freight, and find that the system works very well. It involves some additional expense in roundhouse labor over the old system, but has advantages in other directions, and we do not experience any difficulty in keeping our engines in good condition.

Southern Pacific (Pacific System):

Average mileage of locomotives..... 37,156

Freight locomotives pooled and passenger locomotives double crewed whenever possible. It is only by this method that we could furnish power for the largely increased traffic during the past few years.

Michigan Central:

Average mileage of locomotives, U. S. Div. 46,002

Average mileage of locomotives, C. S. Div. 47,003

Locomotives pooled on United States Division, and double crewed on Canada Southern Division. Single crewing or double crewing, you of course get more work on the engines, out of the men, and if you had plenty of power to do your work, it would probably be the better plan, when conditions are such that you can get more work out of your engines by pooling. I think it would pay to do so.

Rio Grande Western:

Average mileage of locomotives..... 40,517

Pooling engines in good water districts is found to be successful, but is a complete failure on divisions where the water is extremely bad. In connection with bad water, there is sandy condition of the right of way, which adds to the difficulties of pooling. Men must be accustomed to the manner in which the engine is carrying her water, also conditions of bearings, and what points to watch closely. Pooling is the proper course where the conditions are favorable. Double crewing, however, is more desirable when that can be done.

Illinois Central:

Average mileage of locomotives..... 47,800

Some locomotives are double crewed in both freight and passenger service, but chiefly passengers, and others are single crewed, but extra crews are put on to give regular crews time to obtain ample rest. The results obtained by double crewing are entirely satisfactory, and compare very favorably with single crewed engines.

Kansas City, Pittsburgh & Gulf:

Average mileage of locomotives..... 45,150

Up to this time when regular men laid off we had been putting extra crews on locomotives, but commencing with the month of September, 1900, we have been pooling our locomotives. Our conditions almost made this necessary, for double crewing or filling out with extra crews was not satisfactory, as frequently locomotives had to leave their own district and run in other districts on account of being short of power. From an economical standpoint I prefer pooling.

Chicago & Alton:

Av'ge mileage of pass. locomot'v's per month. 4,870

Av'ge mileage of fr'ght locomot'v's per month. 2,624

We do not pool our locomotives, but I am heartily in sympathy with such an arrangement, and to get the best results I feel that in addition to this the engines should be double crewed. You cannot under any conditions get the maximum service of locomotives by assigning one crew to each engine.

Grand Trunk:

Average mileage of locomotives..... 38,865

The modern power on our main line will make from 60,000 to 100,000 miles per annum. When this great mileage is made our engines are double crewed. On one division of this system not long ago we tried pooling, which was not a success.

Missouri, Kansas & Texas:

Average mileage of locomotives..... 58,931

During busy seasons it was our practice to pool engines on some divisions of the line. As a rule our engines are assigned to regular crews except passenger engines, upon which we run double crews. While the average mileage of the locomotives can be increased by pooling, I do not consider the system as desirable in every respect as double crewing, which we find very much more satisfactory.

Minneapolis, St. Paul & Sault Ste. Marie:

Average mileage of locomotives..... 38,328

We aim to keep regular crews on freight engines as far as possible, but during our busy season regular crews are unable to follow their engines, and we are obliged to change crews in order to give more rest and keep engines moving. This plan is practically pooling engines. I would prefer the double crewing of engines to the pooling system, but our divisions are too long to double crew engines successfully. The passenger engines on our western divisions make 407 miles daily, and we use three crews on the run. On our eastern division our passenger engines make 354 miles daily and we use two crews on the run.

New York, Ontario & Western:

Average mileage of locomotives not stated. I am thoroughly opposed to pooling all freight and passenger engines. For the past three or four years we have been double crewing and triple crewing, and I believe this arrangement is the most satisfactory from a service point of view, and the most economical of any. I hardly think any road is now assigning an engine to a man. None of our divisions are over 150 miles long, and as we have no trouble in getting 9,000 miles per month out of our passenger engines with two men, and either 3,000 or 4,000 miles out of our freight engines with two or three men, and our cost of repairs is one cent per engine-mile less than it was when pooling engines. I do not wish to be understood as advocating no engine pooling, for I believe it is necessary to pool certain engines.

Chicago, Milwaukee & St. Paul:

Average mileage of locomotives..... 39,882

As a rule we run regular crews with enough extra men to keep the engine going. We never hold engines for crews, and on some divisions during certain seasons of the year engines are pooled for all practical purposes. On our heavier divisions at this season of the year, our engines will average as high as from 5,500 to 6,000 miles per month.

Chicago & East Illinois:

Average mileage of freight locomotives.... 22,784

Average mileage of passenger locomotives... 37,779

The business of our road is principally hauling coal, and as the demand for that commodity fluctuates, the result is, we sometimes have engines laid out of service, and at other times we cannot supply them fast enough. This will explain the low average mileage of freight engines per annum. If we take the mileage for freight engines for January, 1900, we find they average 3,398 miles per month. This mileage is made by regular engineers assigned to regular engines. When an engineer has been on the road fourteen hours he is required to take eight hours rest, an extra engineer being called to take the engine out. If it happens that we are short of extra men, the regular engineer is sent out on another engine, and frequently the regular engineer does not get back on his engine for some time. You will see from this that we run engines when ready for service regardless of the regular crews. If the assigned engineers are able they go out, if not extra men go.

Chicago, Rock Island & Pacific:

Average mileage of passenger locomotives... 45,864

Average mileage of freight locomotives.... 34,416

We assign regular crews to regular engines. When power is needed we do not hold an engine for the regular crew, but send out extra men, the regular crew taking the engine when she returns.

International & Great Northern:

Average mileage of locomotives..... 51,732

We do not pool any of our engines, but some of them are double crewed; some of our engines making as much as 8,000 miles in a month.

Wisconsin Central:

Average mileage of passenger locomotives... 54,636

Average mileage of freight locomotives.... 38,600

Wherever possible all our passenger power is double crewed. We have passenger engines on our main line between Chicago and Minneapolis which are making as high as 10,000 miles per month. Regular crews are assigned to engines which are assigned to our regular time freight. All other freight power is practically in the pool system, running first in first out. Regularly assigned crews follow the engines until such time as rest is required, and we reserve the right to say how long one man will be in service without rest.

Atlantic Coast Line:

Average mileage of passenger locomotives... 36,250

Average mileage of freight locomotives.... 34,080

The engines are almost entirely run by single crews, though in the rush of heavy business we have extra men who relieve the regular men at intervals.

Texas Pacific:

Average mileage of locomotives..... 32,126

We still adhere to the old plan of a single crew to each engine on the road in regular service.

Boston & Maine:

Average mileage of locomotives not stated. All the freight engines in through service on two divisions of this system are pooled, and we find that in respect to cost of repairs and proper maintenance, as well as cleanliness, these engines compare favorably with those in similar service on other divisions not pooled.

Cincinnati, Hamilton & Dayton:

Average mileage of locomotives..... 40,000

All freight engines and a few passenger engines have one

crew assigned to each engine, the majority of the passenger engines being double crewed. On one division of the road it was found necessary to pool the engines in freight service a short time last spring on account of the heavy business. Denver & Rio Grande:

Average mileage of locomotives not stated. We have a few passenger engines double crewed, otherwise the assignment of one crew to each engine is our method of handling them. Northern Pacific:

Average mileage of locomotives..... 36,813

We do not consider the scheme of pooling engines at all desirable, and only follow it when business is so heavy as to require that we do so.

Cincinnati, New Orleans & Texas Pacific:

Average mileage of freight locomotives..... 37,524

We assign a crew to each engine, and do not pool or double crew.

Mobile & Ohio:

Average mileage of locomotives..... 41,094

Assign regular crews to each engine and put on extra crews when the business is heavy.

Cleveland, Cincinnati, Chicago & St. Louis:

Average mileage of locomotives... 44,000 to 45,000

Do not pool or double crew engines except in some isolated cases.

The above statements from the various roads named seems to embrace all practicable methods of handling locomotives under all possible conditions, and to express every shade of opinion among motive power men. If any one fact stands out in bold relief it is that the old practice of limiting the mileage of a locomotive to the endurance of a single man is giving away to newer and better methods. In order to facilitate comparison of the average mileage of such roads as have given the average mileage of all locomotives, they are recapitulated as follows. One of the above mentioned roads which shows the most favorable results from pooling (Louisville & Nashville) is omitted because it gives the average mileage of locomotives in revenue service only.

Recapitulation.	Average mileage.
C. & B. & Q.....	39,641. Pooled and double crewed.
Pere Marquette.....	43,722. Pooled and double crewed.
Missouri Pacific.....	46,000. Pooled and double crewed.
Wabash.....	30,420. Pooled and double crewed.
N. & W.....	30,050. Pooled and double crewed.
So. Pacific, A. System.....	39,156. Pooled.
So. Pacific, P. System.....	37,156. Pooled and double crewed.
M. C., U. S. Div.....	46,002. Pooled.
M. C., C. S. Div.....	47,003. Double crewed.
R. G. W.....	40,517. Pooled on some divisions.
Illinois Central.....	47,800. Double and extra crewed.
K. C. P. & G.....	45,150. Extra crews.
Grand Trunk.....	38,856. Double crewed.
M. K. & T.....	38,931. Pooled and double crewed.
M. St. P. & S. S.....	38,328. Extra crews.
C. M. & St. P.....	39,882. Extra crews.
Int. & G. Northern.....	51,732. Double crewed.
Texas Pacific.....	32,126. Single crews only.
C. H. & D.....	40,000. Double crewed.
Nor. Pacific.....	36,813. Pooled when necessary.
C. N. O. & T. P.....	37,524. Single crews.
Mobile & Ohio.....	41,094. Extra crews.
C. C., C. & St. L.....	44,000. Pooled in some cases.

The notations of pooled, double crewed and extra crews in the above statement are made to show that these methods are used, but it must be remembered that single crewing is practiced more or less on all roads, and the conditions on some parts of nearly every road are such that there is no chance to pool or double crew locomotives and no necessity even for extra crews, the business being light and trains infrequent.

The roads of which the average mileage of all locomotives is not given, and which are therefore omitted from the recapitulation, are as follows:

L. & N.....	Pooled altogether.
Chicago & Alton.....	Favors pooling and double crewing.
N. Y. & O. & W.....	Double and triple crewing.
C. & E. Ill.....	Extra crews.
C. R. I. & P.....	Extra crews.
Wisconsin Central.....	Pooled and double crewed.
A. C. L.....	Extra crews.
B. & Maine.....	Pooled.
D. & Rio Grande.....	Single and double crewed.

The merits and demerits of the pooling system as compared with extra crews and double and triple crewing locomotives have been the subject of discussion, and two papers on the subject are hereto appended, one by J. F. Deems, Asst. Supt. of Motive Power of the Chicago, Burlington & Quincy, and the other by M. E. Wells, of the same system. These papers contain much interesting information and give the practical experience of men in the Motive Power Department of a large system.

Since writing the above, a reply has been received from the Plant System, from which the following is extracted:

"Our passenger engines make close on to five or six thousand miles per month, and freight engines about three thousand. The majority of our engines are run on the pool system. From the company's standpoint, it is the only proper way to operate locomotives, as I cannot reconcile it to my ideas of economy to allow an engine worth from twelve to sixteen thousand dollars to lie idle in the roundhouse twelve or fifteen hours for an engineer to sleep."

State of Minnesota vs. Northern Securities Co.

At Washington, on Tuesday of this week, the Attorney-General of the State of Minnesota filed, in the United States Supreme Court, a complaint against the Northern Securities Company, asking to have that company enjoined from carrying out the consolidation of the Great Northern and Northern Pacific railroads which, it is alleged, is the virtual and necessary result of the formation of the Securities Company. The bill is the first legal move in the campaign of Governor Van Sant to annul the union of the two roads named.

The first claim in the bill is that the State, as the owner of 3,000,000 acres of land, will suffer by the merger because the railroads, having no further incentive to compete with one another, will cease building branch lines. The amount of income accruing to the State in taxes will be diminished by the checking of development, and the maintenance of educational, charitable and other public institutions will be interfered with. The freight rates on wheat and other merchandise will be higher when the roads are under one control. Detailed allegations are made concerning the personality of the principal organizers of the Securities Company, and it is alleged that, in pursuance of their plan to evade the laws

of Minnesota, these men have organized the Securities Company, have transferred stock, etc. One man or board will be able to fix all rates on all the lines of these companies in the State. This is in restraint of trade and, therefore, against public policy. The Northern Securities Company is a railroad corporation within the meaning of the laws of Minnesota, and the design of the company is to evade, escape and violate those laws. It is alleged that under J. J. Hill, president, the officers of the Great Northern are already managing a large portion of the business of the Northern Pacific.

A second document filed in the United States Supreme Court cites many authorities bearing on the right to institute the suit in this court and summarizes the State's contention as follows:

"The attempted consolidation of the properties of the Great Northern and Northern Pacific, which was defeated in the case of Pearsall vs. Great Northern, is now renewed by the united action of the holders of a majority of the stock of each of said companies, by placing a majority of the capital stock of each in the Northern Securities Company, in order that the last named company may manage and control, through its president or executive committee, all of the railway lines and properties of each of said railroad companies. The principal question raised is: Can a corporation organized under the laws of New Jersey use its corporate powers so as to violate or overthrow the constitutional enactment of a sister State, and thus accomplish indirectly that which this court has held cannot be done directly, especially in view of the fact that the New Jersey corporation was organized for the express purpose of accomplishing this result. The further question is presented, viz.: Does not the consolidation of these railroad companies, which own and operate all the railroad lines situated in the northern half of Minnesota (except two short iron ore carriers), amount to a monopoly in railroad traffic? And is not such a monopoly the subject of challenge, regardless of statutory prohibition?"

Disastrous Rear Collision in Fourth Avenue Tunnel.

On the morning of Wednesday, Jan. 8, about twenty minutes past eight, a rear collision of passenger trains in the Fourth Avenue Tunnel, New York city, near 56th street, resulted in the complete destruction of two passenger cars, and the killing of 15 or more passengers. A large number of passengers were injured, but at the time we go to press it is impossible to state the exact number. The trains in collision belonged, one to the New York, New Haven & Hartford and the other to the New York Central & Hudson River. A local passenger train, No. 116, of the Central, from White Plains, drawn by engine 1,018, ran into the rear of passenger train No. 223, from South Norwalk, on the New Haven road, this train having been stopped about two minutes before, in consequence of the presence of another train in the yard ahead of it. The point of collision is only about half a mile from the Grand Central Station, and the front portion of the New Haven train had already emerged from the tunnel. The trains were on the inner southbound track and, therefore, were in that portion of the tunnel which is not dark; that is to say, the two central tracks at this point are in an open cut, walled at the sides, which is covered only at the transverse streets. These streets are 260 ft. apart, center to center.

At this writing no reliable information concerning the cause of the collision is obtainable. All of the tracks at this point are equipped with block signals, operated manually, and controlled by elaborate electric locking apparatus. The signals are lamps turning on vertical spindles, and there are signals at each block on both sides of the track; in the case of the track on which the collision occurred the lamp on the engineman's side is only one or two feet above the level of the rail; but that on the fireman's side is at the level of the cab window. The electric locking includes track circuits throughout the length of each block section. There is, we believe, a torpedo signal at each home signal. There was no fog.

Foreign Railroad Notes.

The Taff Vale Railway, of Wales, has sued the Amalgamated Society of Railway Servants for about \$125,000 damages, the claim being based on the strike or attempted strike which the society got up several months ago. It will be remembered that up to last July, when the House of Lords gave a decision on a case, it was universally assumed in Great Britain that a trades union could not be sued. The present suit is one of the results of the House-of-Lords decision.

The French have completed 76 miles of the Sahara Railroad, beginning at Ain-Sofra, a station 282 miles from the Mediterranean at the port of Arzew, and extending, chiefly through a barren country with oases where there is water, westward and southward to Duveyrier, where a fort is under construction, near the border of Morocco. The road will, it is said, save a large sum heretofore paid for transporting military supplies, which had to be packed on camels. The most advanced French military posts are about 125 miles further on.

An American express locomotive ordered by the Paris, Lyons & Mediterranean Railroad, and erected at its shops in Arles, has been tried in runs between Marseilles and Avignon with trains of six cars weighing 200 tons. French papers say that with such trains speeds of 76 to 81 miles per hour have been reached, and that the performance generally has been satisfactory.

The Simplon Tunnel was excavated 690 ft. on the north end during October. No excavation could be made on the south end, because of the water, which is flowing at the rate of 130 gals. per second.

Lignite-Burning Consolidation Locomotive—Bismarck, Washburn & Great Falls.

The illustrations show general views, and details of the boiler work, of a lignite-burning consolidation freight locomotive with a Rushton trailing truck, recently built by the Baldwin Locomotive Works for the Bismarck, Washburn and Great Falls Railway. This locomotive is the first of its kind in the United States, as to wheel arrangement, but the Baldwins have sent many of this type abroad. This is the locomotive of which Mr. S. M. Vauclain said in his address at the November meeting of the New York Railroad Club: "It is what we are all coming to, sooner or later;" having in mind the wheel arrangement.

The total weight is 166,900 lbs., the weight on drivers is 128,000 lbs., the front truck carries 16,900 lbs. and the trailing truck 22,000 lbs. The cylinders are Vauclain compound, 14 and 24 x 26 in., the driving wheels are 50 in. in diam., the truck wheels 30 in. in diam., and the working steam pressure is 200 lbs. per square inch.

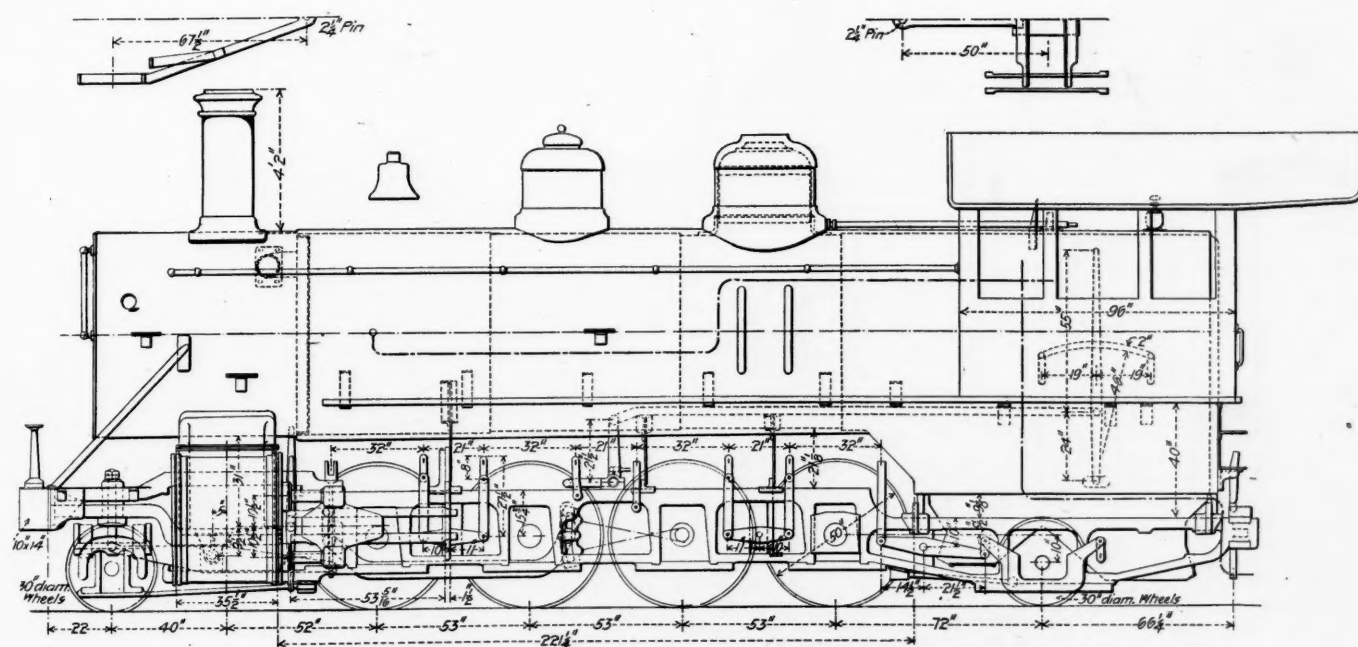
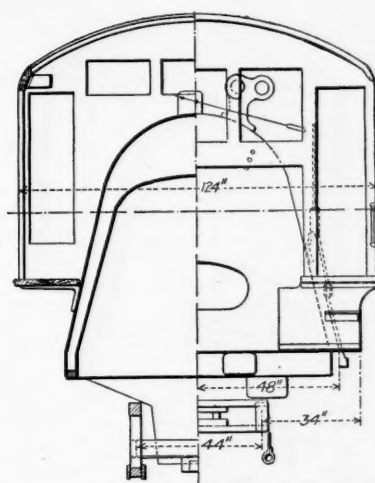
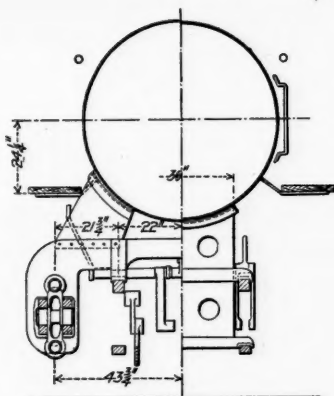
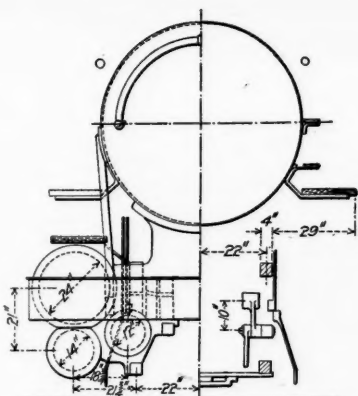
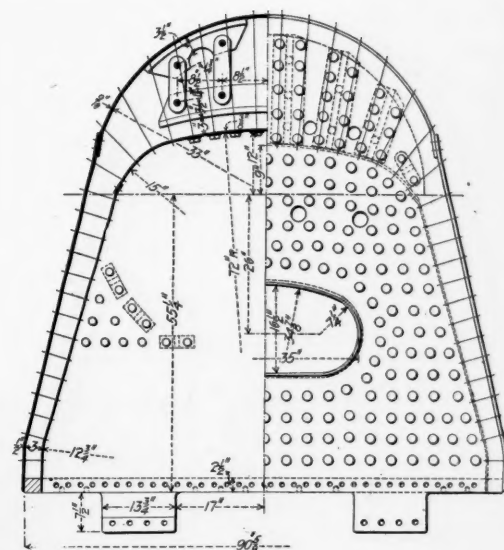
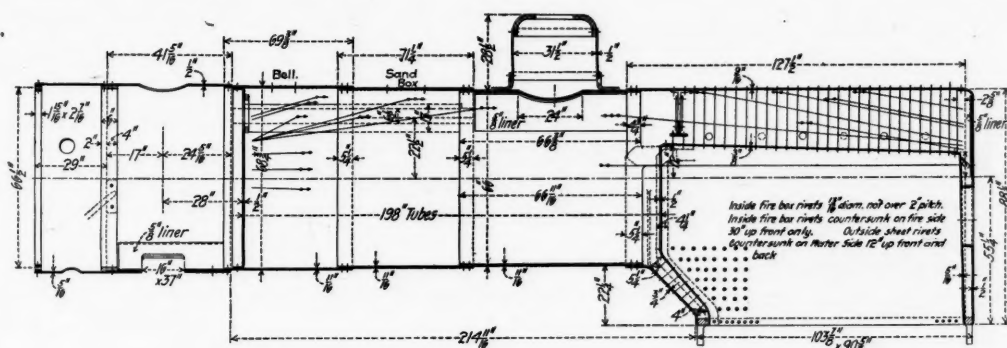
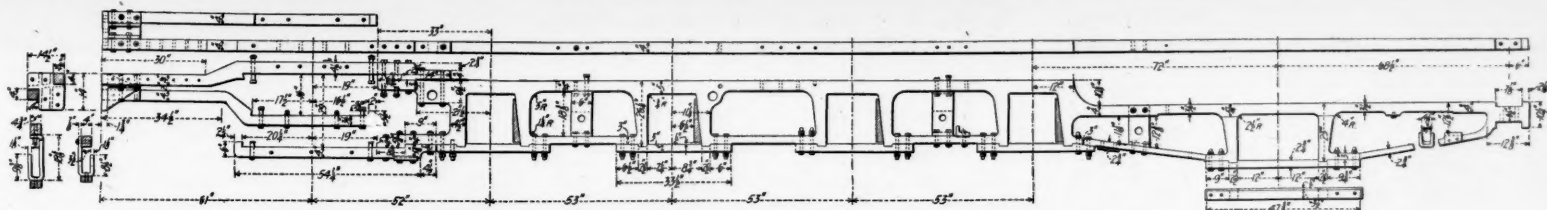
The boiler, complete illustrations of which are given, is of the straight-top type, designed especially for lignite-burning, and is worthy of careful study. The fire-box is very deep and very wide. The dimensions are, 8 ft. 1/16 in. long x 7 ft. wide at the grate line; 67 1/4 in. deep at front and 64 1/4 in. deep at back. The sharp pitch of the throat-sheet gives valuable flamework for the light fuel, the length of fire-box from door-sheet to flue-sheet being 9 ft. 4 in. The grate area is 56 sq. ft., and the total heating surface, 2,496 sq. ft., of which 174 sq. ft. is in the fire-box and 2,322 sq. ft. in the 270 tubes, 2 in. o.s. diam., and 16 ft. 6 in. long over sheets.

The frame drawings show some special features, among which is the spread of 24 in. between pedestal jaws for the trailing truck journals. The locomotive is doing good work and burning lignite satisfactorily which, to those of our readers who know lignite by experience, is saying a great deal.

The general description follows:

Name or number.	General Description.
Gage.....	"Great Falls," No. 3
Simple or compound.....	4 ft. 8 1/2 in.
Simple or compound.....	Vauclain Compound
Fuel.....	Lignite coal
Weight on drivers.....	128,000 lbs.
Weight on truck wheels.....	F., 16,900 lbs.; B., 22,000 lbs.
Weight, total.....	166,900 lbs.
Wheel base, total, of engine.....	26 ft. 11 in.
Wheel base, driving.....	13 ft. 3 in.
Length over all, engine.....	39 ft. 1 1/2 in.
Length over all, total, engine and tender.....	67 ft. 1 1/2 in.
Height, center of boiler above rails.....	7 ft. 10 1/2 in.
Height of stack above rails.....	14 ft. 11 1/2 in.
Heating surface, fire-box.....	174 sq. ft.
Heating surface, tubes.....	2,322 sq. ft.
Heating surface, total.....	2,496 sq. ft.
Grate area.....	56 sq. ft.
Drivers, diameter.....	50 in.
Drivers, material of centers.....	Main, cast steel; others, cast iron
Truck wheels, diameter.....	30 in.
Journals, driving axle, size.....	Main, 8 1/2 x 9 in.; others, 8 x 9 in.
Journals, truck axle, size.....	5 1/2 x 10 in.
Main crank pin, size.....	6 1/2 x 6 in. dia. and 6 1/2 x 6 1/2 in. dia.
Cylinders, diameter.....	H. P., 14 in.; L. P., 24 in.
Piston, stroke.....	26 in.
Piston rod, diameter.....	3 in.
Kind of piston rod packing.....	U. S. Metallic
Main rod, length center to center.....	8 ft. 9 3/4 in.
Steam ports, length (circular).....	6 1/2 in.
Steam ports, width.....	1 1/2 in.
Exhaust ports, length (circular).....	27 in.
Exhaust ports, width.....	4 1/2 in.
Bridge, width.....	3 in. and 2 1/2 in.
Valves, kind of.....	Balanced piston
Valves, greatest travel.....	5 in.
Valves, outside lap.....	H. P., 3/4 in.; L. P., 3/4 in.
Valves, inside clearance.....	H. P., 3/4 in.; L. P., 3/4 in.
Valves, lead in full gear.....	H. P., 0 in.; L. P., 3/4 in.
Boiler, type of.....	Radial stay; straight
Boiler, working steam pressure.....	200 lbs.
Boiler, material in barrel.....	Steel
Boiler, thickness of material in barrel.....	1 1/4 in.
Boiler, diameter of barrel.....	68 3/4 in.
Seams, kind of horizontal.....	Butt jointed, double covering strips
Seams, kind of circumferential.....	Double riveted
Thickness of tube sheets.....	3/4 in.
Thickness of crown sheet.....	3/4 in.
Crown sheet, stayed with.....	Radial stays, 1 1/2 in. dia.
Dome, diameter.....	31 1/2 in.
Fire-box, length.....	8 ft. 1 1/2 in.
Fire-box, width.....	7 ft.
Fire-box, depth front.....	67 1/4 in.
Fire-box, depth back.....	64 1/4 in.
Fire-box, material.....	Steel
Fire-box, thickness of sheets.....	3/16 in.
Fire-box, brick arch.....	Yes
Fire-box, water space, width.....	Front, 4 in.; sides, 3 in.; back, 3 in.
Grate, kind of.....	Rocking bars and drop plate
Tubes, number.....	270
Tubes, material.....	Iron, No. 12 W. G.
Tubes, outside diameter.....	2 in.
Tubes, length over sheets.....	16 ft. 6 in.
Smoke-box, diameter.....	68 3/4 in. I. S.
Smoke-box, length.....	74 in.
Other Parts:	
Exhaust nozzle.....	Double
Exhaust nozzle.....	Permanent
Exhaust nozzle, diameter.....	3 1/2 in.
Exhaust nozzle, distance of tip above center of boiler.....	5 1/2 in.
Netting, wire.....	3 1/2 x 3 1/2 No. 12 W. G.
Stack, least diameter.....	Straight
Stack, height above smoke-box.....	4 ft. 2 in.
Tender:	
Type.....	Swivel trucks
Tank capacity for water.....	5,000 gals.
Coal capacity.....	About 6 tons
Kind of material in tank.....	Steel
Thickness of tank sheets.....	3/4 in. and 1/2 in.
Type of under-frame.....	Iron 10-in. channels
Type of truck.....	Barber
Truck with.....	Rigid bolster
Type of truck spring.....	Full elliptic
Type of truck bolster.....	Channel iron
Length of tender frame over bumpers.....	22 ft. 5 in.
Length of tank.....	20 ft. 2 1/2 in.
Width of tank.....	24 ft.
Height of tank, not including collar.....	4 ft. 10 in.
Height of tank over collar.....	5 ft. 8 in.
Type of back draw-head.....	Washburn Steel Frt Car Coupler
Special Equipment:	
Sight-feed lubricators.....	Detroit
Bell ringer.....	Golmar

(Continued on page 20.)



Lignite-Burning Consolidation Locomotive—Bismarck, Washburn & Great Falls Railway.
Built by the BALDWIN LOCOMOTIVE WORKS.

Front and back couplers.....	Washburn
Safety valve.....	Crosby
Sanding devices.....	Leach
Injector.....	Nathan Monitor
Driver brake equipment.....	American O. S. Equalized
Tender brake equipment.....	Westinghouse Automatic
Tender brake beam.....	Sterlingworth
Air pump.....	Westinghouse
Air pump governor.....	Westinghouse
Piston rod packings.....	United States Metallic
Valve rod packings.....	United States Metallic
Other specialties.....	Rushton truck, rear

The Bohn Refrigerator Car.

The accompanying engravings show a system of car refrigeration devised by Mr. Gebhard Bohn, which is being handled by the White Enamel Refrigerator Co., St. Paul, Minn. This system has been applied to about 1,400 cars owned by some 18 roads, beside which it will be used in connection with something over a thousand refrigerator cars now building. Numerous service tests have been made which, in general, show a saving of ice of about 25 per cent. over other refrigerator cars subjected to the same conditions. At the same time the reports of these tests show a uniform low temperature and dry air.

Referring to the engraving, an ice chamber is at each end of the car. This consists of a galvanized iron tank 2 ft. 9 in. long, more or less according to length of car, 2 ft. 2 1/4 in. wide and 6 ft. 2 1/2 in. deep, mounted on oak gratings. Below the gratings the floor is covered with galvanized iron and slopes to a drip pan, the water from the melted ice escaping through a trap below the car floor. Alongside the ice chamber is a row of 6-in. oak posts which are slatted on the side toward the loading and covered with heavy wire netting on the opposite side. Between the posts are placed galvanized iron "air siphons." The slats and the wire netting protect the siphons from the loading on one side and the ice on the

unless it can be shown that the passenger closed the door in an unreasonably violent way. So the case goes to trial.

The Condition of the Brooklyn Bridge.

The reader will hardly need to be reminded that not long ago, Messrs. Duryea and Mayer made a report for the District Attorney of New York on the condition of the New York and Brooklyn Bridge. The Annual Report of the Commissioner of Bridges contains a special report by Messrs. Buck and La Chicotte, which ought to have equal publicity. Extracts from that report are printed below.

The Duryea-Mayer report can be divided under two heads:

First.—That devoted to a physical examination of the bridge, covering the assignment of the cause of failure of nine suspenders, together with an examination of the causes of deterioration of the bridge, and an arraignment of the bridge management for permitting these causes to exist.

Second.—A criticism of the design of the bridge, with computations purporting to show that it is seriously overstrained in many parts, together with recommendations as to how the bridge should be reconstructed and repaired.

In both cases it is often difficult to ascertain just what is aimed at and the exact character of the conclusions reached, as well as the methods of reaching them.

While there is, we believe, some warrant for the claim in the report that certain unsatisfactory conditions prevail in the bridge, due partly to original design and partly to maintenance, . . . the report fails to show, by either facts or figures, where defects of design or

Every movement of the bridge, transverse or vertical, as well as longitudinal, doubtless contributed something to the breaking of these rods; but the effect of the longitudinal movement, in producing bending stresses in the suspender rods, is so much greater than that of all the others, which is insignificant, that, coupled with inadequate lubrication of the trunnions, it may be properly considered the only real cause. This is clearly borne out by well known theoretical principles as well as patent physical facts. . . .

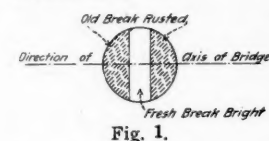
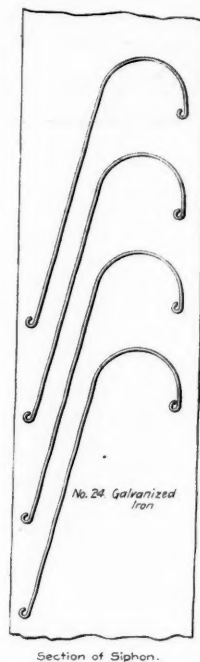
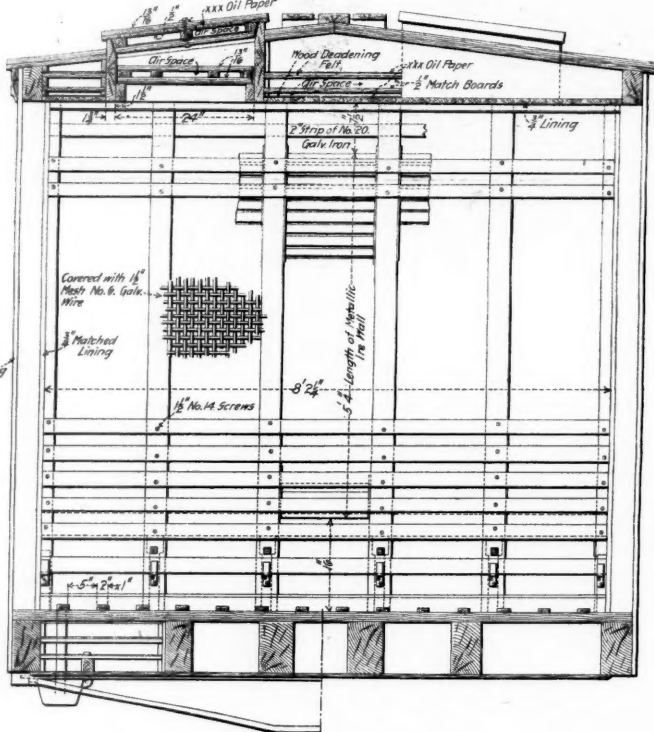
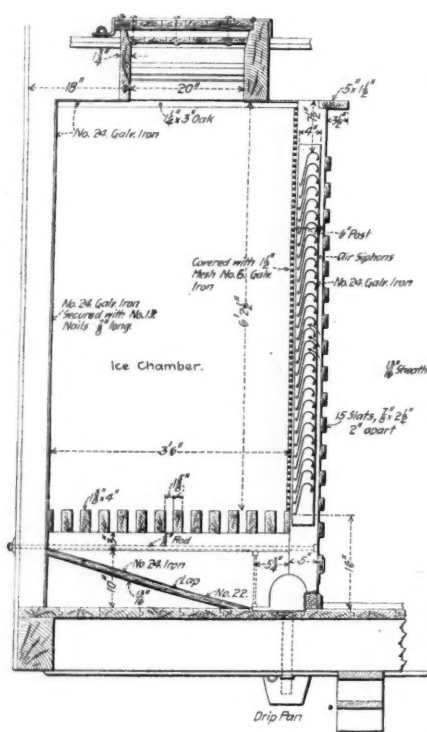


Fig. 1.

of the axis of the bridge. The breaking was doubtless gradual until the section remaining intact was reduced beyond endurance.

The longitudinal movement at the center of main span, from season to season, is about 14 in. between extremes. This movement has at times caused the cable bands to slip on the cables and to bring a number of the rods about the center against the edge of the top flange channels of the main floor beams, and it is our understanding that breaks in the rods about the center were attributed to this interference and consequent bending in the rods. . . .

The only transverse bending that can occur in the suspenders is that due to the change of inclination of cables under lateral movement. A casual examination will show that this movement would have to be far greater than it can possibly be in the present case to produce appreciable transverse bending in the rods. The cables are more free to move transversely



The Bohn Refrigerator as Applied to Refrigerator Cars.

other. Lengthwise of the floor are laid 1 x 2-in. strips so that there is always an air space below the loading.

The chief feature of this system is the use of air siphons for maintaining a free circulation throughout the car. It will be readily seen that the cold air is free to spread along the floor and displace the warmer air in the body of the car, and the warm air flows toward the ice chamber, which it can enter from any level. In entering the ice chamber the air passes through the siphons and it will be seen that when the air once enters a siphon the hood prevents its rising, and in coming in contact with the cold plates the air is cooled and descends into the ice chamber. This screen has been found very effective in promoting a good circulation throughout the car.

The same principles and a similar screen is used in connection with refrigerators for dining cars, a number of these being now in service.

In Prussia an oculist took a seat in a car near the door. The door was slammed to with such force that little slivers of glass flew from it, one of which injured the oculist's eye so as permanently to affect his sight. He sued the management (the Prussian State Railroads) for damages, demanding an allowance of about \$3,000 a year for the rest of his life. The management asked that the suit be dismissed, on the ground that it was not responsible. But the court declared that the door could have been closed with such results only in three ways: By the guard, a servant of the management; by the wind or the motion of the train, or by the passenger himself; and in any of these cases the management is responsible,

inadequacy of maintenance has been productive of serious results. . . . The report makes a severe indictment of the maintenance of the bridge, but as far as condition dependent solely on maintenance extend, there are enough qualifications in the report itself to leave the indictment but slightly supported. . . .

In view of the qualifying nature of the statements, and in view of the fact that net results are entitled to at least as much consideration as ways and means, it is perhaps not unreasonable to state that the unqualified indictment of the maintenance is unwarranted, and is largely a matter of opinion or preconceived prejudice.

But aside from probable errors of opinion there are material errors in a number of the purported facts and deductions in the report that cannot be considered in the same light.

The report claims for itself hasty preparation on insufficient data. Some such interference with the establishment of facts and the reaching of logical conclusions is clearly apparent, but there is a freedom of assumption in places that seems to ignore the necessity of data, or in fact observance of some generally accepted principles of statics.

On page 4 appears the following statement:

"The suspended rods which failed were intended to resist tension and such small bending stress as would arise from a swinging of the rods in the direction of the bridge on lubricated trunnions. . . . An examination of the suspender rods shows that they must be subjected to side bending and that their failure is due to this. We believe the most important cause of side bending is wind pressure."

The above conclusion, as well as the premises on which it is based, are, we believe, in every essential particular erroneous.

than the superstructure, and about the center the cables and superstructure must go together. The report ignores entirely the cradling of the cables, and the fact that this permits a material amount of the wind pressure to pass from the trusses to the cables by direct tension, and not by bending. The report further ignores the existence of wind cables and wind guys, which, while their action is somewhat indeterminate and not easy of computation, their presence in the bridge is a very patent fact, and their restraining influence on lateral motion is unquestionable. There are thus two ways of transmitting the wind pressures on the superstructure other than by bending in the short suspender rods, and this bending on account of the lateral mobility of the cables cannot be material. The foregoing covers the important features of the report based on physical observation alone. The following covers points based on computations, or a combination of computation and physical examination.

In general, the computations given in the report are crude and difficult to follow, and seem to be given more to indicate the amount of ground covered than for the purpose of furnishing to others the means of reaching definite results. There is much discussion of conditions wholly foreign to those existing in this bridge, and use of formulae containing conflicting and confusing nomenclature. . . .

There seems to have been no use made of some very essential data, chiefly the report of Col. Washington A. Roebbling, of Jan. 1, 1877, and Drawing No. 4651, containing, together with other data, the assumptions on which the original design was based. This drawing gives the distribution of load assumed among trusses, over-floor stays and cables, and the ordinates of the cable

curve based on these assumptions. The ordinates are given for different temperatures and different loadings, and show the curve, not a parabola but a compound curve, very much flattened over the over-floor stays, and indicating clearly that the cables were not intended to carry much of the load here. An examination of the cables at the present time shows this object to have been approximately realized. This fact in connection with the assumed fixity of the saddles—a condition likewise practically realized—makes most of the discussion inapplicable to the present structure.

As the saddles are fixed as contemplated by the designer; as the curve of the cables is not a single parabola; as the overfloor stays relieve the cables and tend to fix the position of the stiffening truss, the object of entering upon a discussion where these conditions are ignored, is not apparent.

No attempt will be made to deal with these computations beyond the points wherein the safety of the structure is considered materially in question. These may be divided under four heads:

1. Stresses in the tower masonry.
2. Bending stresses in the cables at the center of the main span.
3. Excessive stresses in parts of the floor system.
4. Excessive eccentric stresses in bottom chords due to stay connections and excessive stresses in these connections themselves.

(1) On page 7 of the report is the following statement:

"The saddles supporting the cables on top the towers, now fixed, were intended by the designers to be movable, and an efficient supervision of the bridge would have used all means necessary to keep them so."

The report fails to take cognizance of a specific contradiction of the above in Col. Roebling's report of Jan. 1, 1877; on page 5 of this report appears the following: "It is not expected that these saddles will move under any passing load after the bridge is completed. The varying strains will be amply resisted by the mass of the tower, but during construction of the bridge the saddles are sure to move." Even if the above statement escaped the notice of the authors of this report, or was not considered by them a clear expression of the designer's expectations, the character of the roller bearings themselves should indicate that it was not expected that the mobility of the saddles should be maintained for a considerable length of time. The rollers are so boxed in by the flanges of the bed casting as to prevent access to any but the end ones, and only to the outer half of these. If the necessity had been entertained by the designer of maintaining the mobility of the saddles by keeping the rollers clean, he would at least have rendered cleaning possible.

The Duryea-Mayer report refuses to justify the apparent acceptance of the bridge management as warrantable of the ultimate fixity of the saddles. . . . Again, on page 10, Appendix C, the report states:

"This fixedness of the saddles was a condition not contemplated by the designers of the bridge. It was at first considered by us a serious deterioration in the safety of the structure, which view would be shared by engineers in general. Further estimates of strength, however, show that while the cessation of motion has indeed increased the stresses in the tower masonry quite materially, it has at the same time caused a decrease in the large and hitherto unappreciated stresses in the cables at the middle of the main span, so that the net effect of the stoppage of motion of the saddles is probably a benefit to the bridge."

"Even had our computations shown that it is desirable to have the saddles movable, it is very doubtful if any ordinary care and supervision would have prevented the same from becoming fixed."

It is hardly possible to reconcile, save on the grounds of prejudiced judgment, the culpability of maintenance for not preserving the mobility of the saddles, and the fact that "the net effect of the stoppage of motion of the saddles is probably a benefit to the bridge." It cannot be questioned that the fixity of the saddles is desirable in every respect, except in that it increases stresses on the tower masonry. This the report considers serious, but fails to disclose any facts to maintain the opinion, while it discloses several to contradict it. . . .

Despite the apprehension expressed as to the bending in the towers, which is only exceeded perhaps by the apprehension of the effect of bending in the cables at the center, the report makes the following reassuring statement on page 4, Appendix B:

"A careful examination of the parts under greatest pressure, however, though made with a powerful marine glass from a distance of only 10 to 20 ft., shows no visible signs of deterioration. Inquiry also showed that no trouble had ever been had with the pointing mortar between the stones at places where the greatest pressure occurs, and that this pointing had never been replaced since the completion of the bridge. Both report and appearance indicate that the masonry is of an excellent quality and able to bear with safety as great pressure as it would ever be considered safe to use in the main body of granite masonry."

(2) The most serious source of danger to the bridge is considered by the report to be bending stresses in the cables at the center, due to combined action of temperature and moving loads. On page 20 appears the following, the computations leading to these deductions being given in Appendix D:

"Excessive stresses in the cables at the center hinge or slip joint is the most serious cause of danger to the bridge. Our calculations show the maximum stresses to be, if no

account is taken of the loads borne by the stay system:

	Lbs. per sq. in.
From fixed and moving loads.	44,800
From bending of cables as a whole.	28,600
From bending of individual wires.	2,000

Total 75,400

"If the 75,400 lbs. per square inch stress above is reduced by the amount which may perhaps be eliminated by the stays, the stress in the cables from above cause is 71,000 lbs. per square inch. This is about 18 per cent. in excess of what we regard as permissible working stress—60,000 lbs. per square inch. This stress of 71,000 lbs. is, however, increased by the wind pressures, but to what extent is not yet known. The condition, therefore, is a very serious one—that of a stress in the cables much above the safe limit, but with its exact amount unknown."

While the computations in Appendix D, on which the above conclusion is based, are in themselves generally reasonably correct, the controlling assumptions on which the computations are based, are purely arbitrary and essentially incorrect in the following particulars:

The friction assumed among the wires, especially along the under side of the cable where the secondary stresses are heaviest, is several times greater than can possibly exist. . . . This condition of friction among the straight wires is dependent almost entirely upon the pressure put on them by the wrapping wires and by the cable bands. This the report assumes to be about 20,000 lbs. per sq. in., while in fact it probably does not now exceed 2,000 lbs. per sq. in., although when the wrapping was put on, it was, of course, very much more.

The cables were wrapped when stressed only by their own weight, and it has been found impossible under such conditions to compress the cables sufficiently to get only the theoretical 10 per cent. of voids. The ratio of net to gross section is found in practice to be 1 : 1.3.

However, when the rest of the dead load is applied, the wires becoming very much more tense, draw closer together, actually leaving the wrapping in places slack. This fact is clearly attested by the condition of the wrapping where it has been removed in places. It is further attested by the fact that under the cable bands in many places, probably as a rule, the wrapping is pushed by the cable bands entirely away from the straight wires at the under side of the cable. Another clear proof of the general absence of considerable stress in the wrapping wires, is the frequent bunching up or riding of these wires where there is any tendency to crowd them together. It is, we believe, clearly impossible for the pressure on the wires on the under side of the cable—which are the only ones materially affected by bending—to cause even a remote approach to the condition claimed by the report, tending to confine the slip of the wires on each other to such narrow limits and causing the cable to approximate in action so closely a solid cylinder. Even assuming the angle in the cable at the center of the span formed as computed with the comparatively small radius of bend, the actual condition of friction among the wires cannot possibly be such as to cause more secondary stress in the wires than 10,000 or 12,000 lbs. per sq. in., and probably not so much. It is possible that friction on 10 ft. of No. 7 wire in a section of cable specially prepared and wrapped in the shop with 20,000 lbs. per sq. in. tension in wrapping wires, will equal its tensile strength; but there is nothing to show that the experimental condition and the condition in the case of the New York and Brooklyn Bridge are remotely within the range of comparison.

The radical character of the assumptions as to friction and bending in the cable is perhaps more clearly shown when it is understood that, according to the calculations of the report, while the wires at the bottom of the cable are stressed to 75,400 lbs. per sq. in., those on top the cable are stressed to only 14,800 lbs. per sq. in. (ignoring the relief of the stays).

Another essential assumption in this deduction of bending stress in cables, is that the curve of the cable at the center is a parabola under dead load and at mean temperature, and that the two center suspenders must take care of the heavy excess reaction coming to that point because of increased deflection under temperature and live load. Neither of these assumptions is necessarily correct, and both are certainly not correct in the present case. The curve of the cable at the center is susceptible of being shaped at pleasure within certain limits which, however, will doubtless cover the movement tending to produce bending at this point. And as an accompanying condition, interdependent with the cable curve, the suspender reaction will vary as far as the adjustment of the curve extends. Thus, in Fig. 2, if A, B, C, D, E is the original parabolic curve of a cable, it can be so altered by adjusting the pull on the suspenders as to flatten it at C and sharpen it at B and D, as shown. This adjustment can be made just sufficient to counteract the tendency under high temperature and maximum downward bending loads, to form a sharp angle at the center. The adjustment will, of course, disarrange the uniformity of suspender reactions and stiffening truss stresses somewhat about the center, but not to an extent that will render it difficult to provide for, as the necessary flattening at the center need be

but very slight. The tendency to bend, whatever it may be, will still exist, and the consequent reactions have to be transferred to the cable, but its transfer will be, by the adjustment, made through a number of suspenders, and in such a way as to prevent any possible formation of a sharp angle at the center.

In the case of the New York and Brooklyn Bridge, there has been ever since its completion a considerable amount of work done on the short suspender rods at the center. It is difficult after slacking off the nut of a suspended to screw it back up to its former place, and as a consequence of having to slack off a number of the suspender nuts about the center, there has been a lowering of the trusses, as is evidenced by a slight but distinct droop of the trusses at the center. Although this adjustment was not done with such an object in view, it has very probably been sufficient of itself to prevent any considerable bending at the center.

When the result of the survey of the cables is obtained, the effect of the conditions about the center can be more definitely ascertained. However, we feel fully justified in stating that the Duryea-Mayer report fails to show any serious conditions from bending in the cables at the center, but that there is evidence that such conditions do not exist.

If the survey of the cables should show a condition calculated to permit serious bending at the center, the remedy lies in the simple expedient of so adjusting the suspenders here as to make the cable form a parabola at maximum temperature and under most unfavorable condition of loading, and at other times a compound curve with undue sharpening at no point of it.

(3) Concerning stresses in parts of the floor system, the report has the following, on page 23:

"Intermediate Floor Beams of Railroad Tracks.—The actual stress is 27,000 lbs. per square inch, and should be only 14,000 lbs."

We find the "actual" stress in this case to be generally 14,200 lbs. per sq. in., and possibly, in some cases, 18,300 lbs. per sq. in.

Again the report has, on page 24:

"Intermediate Floor Beams of Roadway.—The stress is 23,000 lbs. per square inch and should be only 14,000."

We find the stress in this beam to be 11,600 lbs. per sq. in.

Again, on page 23:

"Channels Supporting Intermediate Floor Beams.—Those along the outer high truss have stresses of 34,000 lbs. per square inch, and those along the inner high truss 17,000 lbs. . . . The working stress should be only 14,000."

We find the stress in the channel along the outer high truss to be 20,600 lbs. per sq. in. and that along the inner high truss to be 11,200 lbs. per sq. in.

Again, on page 24:

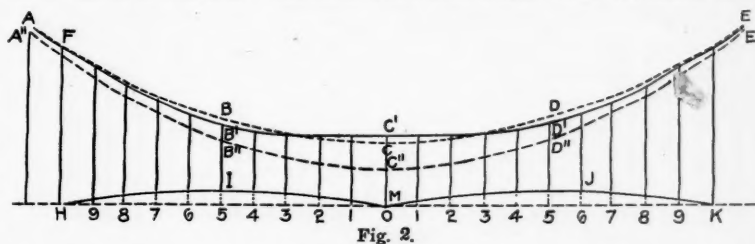
"Planks of Roadways.—Those below the trolley wheels have 3,140 lbs. per square inch stress. . . . The stress should not be more than 1,300 lbs."

We find the maximum stress in the roadway planking under the trolley tracks to be 1,740 lbs. per sq. in.

In Appendix D, page 59, is the following:

"The stringers of railway tracks rest on main floor beams and intermediate floor beams. The latter are 6 in. I-beams, 40½ lbs. per yard. If they are calculated in the usual manner the stress per square inch is 27,000 lbs."

The qualification "if they are calculated in the usual manner," has very important bearing on the case, and its presence in the body of the report, as well as in the Appendix, would seem proper. It is due largely to this



qualification and a different understanding as to how "actual" stresses are obtained, that the resulting stresses in the report and those obtained by ourselves, differ so materially. The panel lengths of this bridge are only 7 ft. 6 in. center to center of floor beams. This is such an extremely short panel that in order to ascertain stresses that "actually" exist it is necessary to depart from the usual method and to adopt that of distributing the load among several parts involved, according to their elastic behavior.

We do not maintain that even with such short panels as exist in this case, it is proper to proportion a floor system, in making an original design, other than by the usual method—especially when a unit stress of 14,000 lbs. per sq. in. is allowed without considering impact. But a close approximation of existing conditions must be made to show why, with apparent stresses of 34,000 and 27,000 lbs. per sq. in., the floor system has not long since deflected out of shape and gone to pieces, as it inevitably would if these stresses did exist.

While in making a design the beam action of the rail and wooden stringer for the full 7 ft. 6 in. panel length would not be considered, they both do thus transmit a considerable part of the load.

Considering the entire system between main floor beams, and the fact that each member will carry according to its elastic behavior, we have, generally:

	Lbs. per sq. in.
Extreme fiber stress in rail	8,950
Extreme fiber stress in stringer	760
Extreme fiber stress in supplementary floor beam	14,200

Or, under most unfavorable conditions, when a rail splice and stringer splice came off the main floor beam:

	Lbs. per sq. in.
Extreme fiber stress in rail	10,400
Extreme fiber stress in stringer	975
Extreme fiber stress in supplementary floor beam	18,300

This does not consider the deflection of the built longitudinal stringer at the center of the track, which deflection is inappreciable.

In the case of the roadway planking, calculating in the same way and considering two of the 4-in. x 10-in. flooring plank to act under the trolley rail, which is a low estimate considering the manner in which these planks are wedged and spiked together, we get:

	Lbs. per sq. in.
Extreme fiber stress in planking	1,740
Extreme fiber stress in supplementary floor beam	11,600

This does not consider the trolley rail on account of its being so shallow, although it does afford some relief.

The stress in the longitudinal channel along the outer high truss, due to loads on both railroad and trolley, will be, counting net section of channel, 20,600 lbs. per sq. in., and 11,200 lbs. per sq. in. on the inner high truss.

While absolute accuracy is not claimed for these figures, they certainly reasonably approximate the stresses that actually exist, while those of the report applied to the same cases do not.

A point that bears materially on this case is brought out on page 2, Appendix B, of the report, where there is this statement:

"Those (rivets) which were tested, however, were tight and in good condition, giving us reason to suppose that the others were likewise."

One of the first indications of seriously over-strained parts in a bridge-floor system is loose rivets, and the absence of such may be taken as a fair indication that the danger point has not been reached.

Although not so high as indicated by the Duryea-Mayer report, the stresses as we find them, are, in places, higher than seems warrantable in present railroad or even highway bridge practice, especially when no account is taken of impact and the live load is about 90 per cent. of the entire load. We believe that some reconstruction of the floor system is advisable under both railroad and trolley tracks, more with a view to reducing deflections and impact effects than to meet any possibility of failure. We consider such possibility of failure extremely remote for the following reasons:

First.—The 45-ton locomotives formerly used on the bridge produced much greater stresses than the present motor cars, and yet caused no failure.

Second.—We understand that the steel throughout the bridge is of such quality that it can endure much heavier stresses than it would be proper to put on the best bridge steel of the present day. We understand that this steel is of 80,000 lbs. ultimate strength and 55,000 lbs. elastic limit, and will bend flat on itself without fracture. If this is so, it is not proper to consider this steel in the same class as the customary steel of 60,000 lbs. ultimate and 35,000 lbs. elastic limit.

We believe the reconstruction necessary to bring all stresses in the floor system within very conservative limits, is small in amount, will cost but little, and can be accomplished without material interference with traffic.

(4) In the matter of stresses in the bottom chords of the stiffening truss within the stay system, due to the action of the stays, the latter are assumed to carry a vertical load varying from $4\frac{1}{2}$ tons per lineal foot at the towers, to 2 tons per lineal foot at the ends of the stay systems. Under this condition of loading the report gives a stress of about 14,000 lbs. per sq. in. on the lower chords of the trusses induced by the stays, which is, as stated, moderate.

The connections of the stays to the chords are eccentric to a marked degree, but are not productive of such effects as would be gathered from the Duryea-Mayer report. This eccentricity can be properly cared for by adequately tying together the two sides of the chord.

The stirrups passing through the rope sockets of the stays and some of the suspenders, when viewed from the light of the designer, are also unduly eccentric, but the test of 18 years of service and the extraordinary test imposed upon some of them by conditions producing the buckling of the bottom chords, has not only produced no failure, but no noticeable distortion. However, it is a simple matter to relieve the stirrups of the greater part of this eccentric stress, and we think it may be advisable to test the detail in full size and make the stirrups practically good for the strength of the rope.

Under the above assumption of loading, the stays attached to the lower chord at a distance of 150 ft. from the tower, would carry a load of 3.63 tons per foot of bridge, or 13.62 tons per stay. The horizontal component in the chord is 14 tons, or 28,000 lbs. The increment of direct stress in the chord at each stay in this

$$\text{portion of the system is } \frac{P}{A} = \frac{28,000}{28} = 1,000 \text{ lbs. per sq. in.}$$

The eccentricity of the connection induces a secondary stress in one corner of the section amounting to $\frac{P}{A} = 3,730$ lbs.

The eccentric stress is necessarily more or less distributed by the rigid floor beam connections and bent stay plates in the chords.

A more careful consideration of this eccentric stay action on the chords would be necessary to fix within reasonable limits the share of responsibility it must carry for the overstressing and buckling of the chords,

but it will probably not be found the "main cause" of failure, or more so than the several other influences that combined to produce this result. Among these influences may be mentioned loading greatly in excess of what was proper; the excessive heat which closed the space between the timber flooring at the slip joint at the center of the main span, causing material interference with freedom of expansion here, and which also so inclined the short suspenders about the center as to put a considerable increase of compressive stress in the bottom chords next to the cables; or the imperfect unification of the two sides of the chord section.

All these conditions combined to produce the failure and it is not safe to infer that had there been no eccentric stay attachment to the bottom chord, the failure would not have occurred.

To the above unit stress of 14,000 lbs., there has been added another of 5,000 lbs., due to induced stress in the lower chord by the cantilever action of the stiffening truss alone. This action of the truss is discussed at considerable length in the report, but no mention is made of, or allowance made for, the presence of slip joints in the top chords at about 115 and 235 ft. each side of each tower; and as the area of each chord section at these points is about 20 sq. in., these slip joints are credited with the impossible performance of transmitting each $20 \times 5,000 = 100,000$ lbs. A careful examination of these joints shows that there has been no motion for several years, as the paint remains unbroken, which is conclusive evidence that such stresses as claimed could not have existed.

The maximum of 19,000 lbs. per sq. in. in the lower chord is based on erroneous assumptions and is probably considerably too high.

The remedy suggested by the report for the supposed excessive stresses in the tower masonry and in the cable at the center of the main span, both due to bending, consists chiefly of the construction of anchor bents near the centers of the land spans, and the removal of suspenders in both land and main spans, together with the release of the saddles and a certain amount of reconstruction of the stiffening truss and stay systems. Neither of the conditions it is sought to remedy has been shown to exist, and almost certainly do not exist to a degree calling for remedy. However, if they did, the means suggested would be extremely doubtful as to satisfactory performance, and would doubtless require, not only entire reconstruction of the stay system, but also material reconstruction of the suspended superstructure, which, it is claimed by the report, will not be necessary.

The feature of the anchor bents was seriously considered in making the original design, but was discarded as unquestionably bad. It would add greatly to the indetermination of the structure, which is already indeterminate to a most undesirable extent. It would impose excessive stresses in the stiffening truss at high temperature, and excessive stresses in the cables at low temperature.

The removal of the suspenders as proposed, would be very questionable in an original design where the entire construction can be adapted to this condition, but to remove them from the present structure, with no more reconstruction of the suspended superstructure than is proposed, would be doubly so.

We summarize our conclusions as follows:

(a) There is some warrant for the claim in the report that the methods of maintenance and inspection have not kept in thorough repair and adjustment certain parts of the structure, but the cases cited are few in number and unimportant in character, and do not appreciably affect the safety of the structure.

(b) Wind was not the controlling cause of the breaking of the suspender rods near the center, and in fact could have contributed only very little to the breaking. The cause of the breaking was clearly due to longitudinal movement of the trusses under temperature changes and moving load, coupled with excessive friction in the trunnion bearings. The arrangement for taking care of this movement was inadequate.

(c) It was not the intention of the original design that the cable saddles should move after completion of the bridge. No physical facts or computations given show the fixity of the saddles to be a serious or even undesirable condition.

(d) While the floor system under the elevated and trolley tracks is not actually stressed as high as claimed by the report, the stresses are higher than we think should be permitted in some parts.

(e) The bending stresses in the cables at the center of the bridge are certainly not serious, and probably are not material.

(f) The attachment of the over-floor stays to the bottom chord, and the bent rods forming the stirrups of the over-floor stays are not good details, but their defectiveness is not so serious as claimed by the report.

(g) The general scheme of reconstruction by means of anchor bents near the centers of the land spans and the removal of a large number of suspenders, we believe to be unnecessary and very questionable. Further, if it is not attended by the entire reconstruction of the stiffening truss and over-floor systems, it will be very precarious.

Although a full report as to conditions of loads and stresses cannot be made until the results of the survey of the bridge are obtained, nor detailed recommendations made as to what should be done to establish throughout the bridge a thoroughly satisfactory condition, we think

that the following general recommendations can properly be made here:

(a) That the bridge be subjected to rigid inspection by an engineer as well as by competent mechanics under his instructions, and that suitable records be kept showing the results of these inspections.

(b) That the floor system under the trolley and elevated tracks be reconstructed so that undue stresses will not exist in any part of it.

(c) That the buckled sections of the bottom chords be replaced by sound sections, and that, wherever necessary, the bottom chord be stiffened or reinforced to properly carry all stresses to which it may be subjected.

(d) That the end connections of the over-floor stays be made practically equal in strength to the stays themselves.

(e) That all parts of the bridge, where it is practicable, be thoroughly adjusted, so that each member, as far as possible, shall take the stress it is intended to carry. This applies chiefly to the over-floor stays, suspenders and diagonal bars of stiffening truss.

(f) That wear, chafe and improper motion be prevented as far as possible.

(g) That all practical means be adopted to prevent accumulation of dirt and rust on all parts of the bridge.

We believe that if the foregoing suggestions are observed, the bridge will be put and maintained in such condition that it will serve in perfect safety for an indefinite term of years, or until the consideration of increased capacity and the desirability of having it more thoroughly modernized, renders reconstruction of the entire suspended superstructure advisable.

Such reconstruction, however, will not be practicable until the completion of Bridge No. 3, when the traffic of the New York and Brooklyn Bridge can thereby, without serious public loss or inconvenience, be relieved to conform to the demands of reconstruction.

While it is understood that steps have been taken independently of this report to inaugurate some of the recommendations above made, it has been our purpose to put on the same basis these recommendations and those of the Duryea-Mayer report, which were based on conditions prevailing at the time of the failure of the suspender rods. Very respectfully,

R. S. BUCK,

Chief Engineer in Charge of Bridges Nos. 3 and 4.

H. A. LA CHICOTTE,

First Assistant Engineer, Bridges Nos. 3 and 4.

The Per Diem Basis for Settlement of Freight-Car Hire.

BY J. M. DALY, General Manager of the Cape Breton Extension Railway.

I have noticed with pleasure the articles appearing in the *Railroad Gazette* from time to time on this subject. I believe that with the adoption of per diem, the conditions now prevailing which partially justify some roads in opposing it, will rapidly disappear, and the new condition replacing it will more than justify both loaner and borrower in continuing its use.

Let us consider the objections to per diem. One, brought by the smaller or feeder roads, is that the increased cost of handling the traffic they deliver to the Trunk Line or loaner would unwarrantably reduce their earnings; and as the loaning road secures the long haul it should allow the borrowing road a greater share of the rates under per diem than is now allowed.

For the present, allow this claim to be well taken, what difficulty is there in changing the basis of division? It should be changed to a certain limit; that is, the concession should be only equal to the per diem charge for a reasonable number of days time, in which the borrower can move and load the car, or one-half the time required under reasonable conditions and supervision to complete the through movement. This would overcome one of the principal losses of equipment now sustained by the loaner, without putting any hardship on the borrower, other than to compel him to so organize that he can handle cars and goods with reasonable despatch.

The borrowers also contend that the rate must be nominal.

This is just. If they will note all past arguments made by loaning roads they will see that the rate was based on less than the cost of maintenance of cars, by reason of the basis used in determining the cost of maintenance. This basis is 365 days per year, while the records show a portion of the cars are not required over six months each year. For instance, a road owning 30,000 cars finds that it is short, six months each year, about 10,000 box and coal cars. Then it builds that number, knowing that for six months out of each year this 25 per cent. of its cars will be idle (and should crops or general business fail the cars would be idle 12 months out of each year). Would not the road be justified in using six months, or 180 days, as the basis in determining the average cost per day of maintenance? They find each car costs them \$72 a year. This they divide by 365 days, and show about 20c per car per day, which is then used as the basis instead of taking 10,000 cars at 180 days, making an average of 40c per car per day. Taking the flat cars, used only in summer, and figuring on the same basis you will put the rate to the borrower on a much higher basis. And as the borrower invariably requires the cars during the busy season the loaner suffers the loss at the time when he had intended, by building new cars, to protect himself.

This applies to small roads that for some reason do

not own equipment. For small roads owning sufficient cars to protect their portion of the joint service the rate per day cuts no figure, whether it be 1 cent or \$1 if cars are exchanged on a fair basis. One car offsets another. The balance of days due is for failure to properly handle. It is as just to charge this to the owner as it is for the delaying road to pay the full cost of a claim on a through shipment.

Now, what advantage will the borrowing road receive under per diem to offset the alleged loss? An increased supply of cars during busy seasons by reason of the increased movement secured. The loaner will be able to spare cars, when called for, and the borrowing road will not need to get cars 60 to 90 days in advance of its requirements, as is now done, regardless of the fact that the loaning road could have used the cars in other sections and must lose revenue for want of them. With this increased car supply the borrowing road may secure an increased competitive tonnage. For instance, A, B and C represent three loaning, or trunk lines, running east and west. X and Y represent borrowing, or feeder, roads running north and south. A and C can load anthracite coal to competitive points on B through X or Y under per diem, which they won't do now on account of the delay and abuses in releasing cars which are fostered under the mileage plan. X and Y can take A and B cars to junction with C and secure traffic for itself and A and B against C, who now handles it. The same holds good in using C cars to take tonnage from A and B junction points to be routed via C. The small borrowing road's earnings are measured not by the rate per day or mile, but by the number of cars it can secure during the busy period. If the manager of such a road will examine his books I am sure the month in which he had the largest balances against him on car hire account will be found to be the month in which net earnings were the greatest. Instead of complaining that car hire expense is large, he should congratulate himself on it, and pray for an even greater balance in the future.

Belt, switching and car ferry lines object to paying per diem, for the reason that under the mileage plan they pay nothing. We cannot blame them; but we should censure ourselves for permitting this plan to exist so long. The earnings and dividends of these companies all tend to show that they can stand per diem; and by enforcing demurrage against delinquent consignees they can protect themselves. As most Belt roads are owned jointly by roads in their vicinity, it will result to the advantage of the owners themselves.

Another objection is brought by roads owning large and valuable terminals in cities, who are called upon by less fortunate roads to switch to industries cars carrying traffic that is competitive. State laws requiring them to do so at a low rate. It is claimed by such roads that their valuable terminals are overcrowded with foreign cars delivered to them faster than consignee can unload; and that a per diem charge under such circumstances would be a further hardship. By reason of the great surplus of cars held awaiting delivery their terminals are so congested as to render the movement of their own traffic slow and expensive.

The mileage-per diem plan which was tried two years ago proved conclusively its usefulness as a remedy for this trouble. It forced roads to so organize their large terminals as to know how many cars of coal John Smith had on the terminal tracks and how many cars per day he was unloading; and where his business was coming from. The first move made by per diem roads was to notify John Smith that the road would hold two days' supply, say 20 cars, and if he unloaded his average of 10 cars a day the delivering road would accept 10 cars a day from its connection. This compelled the originating road to hold the surplus in its own yard, and brought vividly to its attention the fact that the shipper, or John Smith, was loading cars in greater number than they could be disposed of. The supply of cars at the mines was then diminished and the cars were used to take care of shipments from other mines for consignees that previously had been short of cars.

This was the instrumentality with which the road owning valuable terminals cleared its tracks of such dead timber. It resulted in bringing order out of chaos and both home and foreign cars were switched at a largely reduced cost. Traffic was moved in one day when previously it had required eight to 10 days.

Another claim against per diem is the fact that the introduction of large cars has resulted in getting ahead of consignees' facilities for unloading. In other words, the consignee is obliged to unload a 50-ton car into a 25-ton shed. This, I believe, is a small factor in the cause of delay. And, has not the consignee brought this condition on himself by his constant demand for lower freight and switching rates? Again, does not the consignee insist on getting his 50 tons of coal in one 50-ton car in order to pay \$2 for switching instead of \$4? Why then should he not keep pace with the times and requirements or regulate his shipments to his capacity to handle? And as the 50-ton car represents nearly double the money invested in one 25-ton car the car owner is entitled to consideration on that account.

Railroads certainly cannot be expected to turn backwards in the one channel through which they have been enabled to earn a dividend of late.

Another objection is found in the fact that some roads, having a short intermediate haul, can, in some instances, finish a movement on the same day that the car

is received. This is also an exceptional condition. The fact that roads can provide the facilities to so handle cars justifies them in taking what little advantage there is to be gained in this way. It is quick movement that we are looking for; why put anything in the way?

The claim is made that per diem will increase the empty mileage account and thus increase operating expenses. Fortunately, the channels of commerce are such that it is unnecessary to move cars empty to save per diem expense. All large business centers are magnets that attract traffic; and foreign cars can be used to carry freight in a homeward direction. Where the movement is heavy in one direction the road needs the cars and should pay for them. As the movement is light in the opposite direction no additional train service is required, hence little or no additional expense is incurred in returning cars empty at once. It must be that the objection to per diem from an empty car haul standpoint is based on the ground that it will prevent roads receiving cars in May and June loaded with anthracite coal or other commodities for brokers in the western field who buy and ship at that season on account of the favorable summer price, expecting to hold the freight in cars until October or November to secure the advanced market price of 50 cents or a dollar a ton, at the expense of the owners of the car and of the track on which it is stored.

Another case where increased expense will be brought in with the adoption of per diem will be where roads releasing cars in the grain-growing States in May or June hold them until October or November for the coming crop to mature, while at the same time they are loading their own cars east into the territory of roads owning the cars stored, in order to save the mileage expense on foreign cars and to secure the mileage earnings on their own. At the same time their eastbound trains are running light and could move the foreign cars empty at a trifling additional expense. Such roads, however, prefer to hold the cars for the busy season, when they have not sufficient cars of their own, ignoring the urgent requests of owners for return of cars to be used in business from the Lakes or other sources they are fortunate enough to have.

It is asserted that under per diem rules sharp traffic men will waive the charge in order to secure traffic; allow that this is so; they can only give up the earnings on their own property. It is simply another way of cutting rates. This is not a new danger. On the other hand, see how many thousand foreign cars are delivered to feeder roads by intermediate roads in July and August when the delivering road knows that the business for which the cars are supplied will not move until October. How careful the delivering road is to guard against any of its own cars being among the lot! Will not per diem close up this avenue of loss?

The feeder line, or borrower, will not stock up 90 days in advance on the per diem basis. If the delivering line wants the business, it will have to do the stocking up with its own cars and permit the owners of cars now abused to secure the service which now is lost them.

There is no more reason for waiving per diem than there is for waiving claims for repairs to cars, or waiving a portion of the earnings of shipments handled. This method of rate cutting should not under any circumstances be tolerated for a moment; for, after the levee once breaks, there is no telling when it can be closed or what damage will result.

What benefits will per diem bring and what is necessary to secure them? First, the department in charge of car service, be it the car accountant, the car service agent, the superintendent of car service, the superintendent or the general superintendent of transportation, must, on most roads, be strengthened, either with more help or a higher grade of help. This department must be given authority over the distribution of equipment and full support in the enforcement of its orders pertaining thereto. This should be done whether we do or do not adopt per diem, as is shown by the results on roads that have thoroughly organized that department. Put competent men in charge and hold one department only responsible for the movement and service of the equipment. When the mileage-per diem plan was inaugurated few if any of the roads had accurate or reliable records to show the correct date of receipt and delivery of cars, and it required some months to get their records up to a proper and correct standard; and those roads were by no means below the average.

With an improved car-record force will come an improved condition in agents' reports of receipt and delivery of cars, by reason of closer scrutiny of reports and better correction of errors; and the exchange of tissue copies of reports between agents will also tend to improve their accuracy.

The strict enforcement of demurrage at points where it is in effect at present and the extension of the demurrage rules to all other stations, local as well as competitive, allowing the officer in charge of car records to check up and verify the returns, will insure against loss and abuse and produce some revenue to offset in part the per diem expense.

The establishing of a clearing house for settling accounts, both for car hire and ticket sales, would materially assist its successful operation; but it must be borne in mind, that each road will have to keep its own records, independent of a central or clearing house, in order to be in position at all times to know where each car on its tracks is and what it is doing. The experience gained in

the operation of the New England clearing house should not be lost sight of. The records obtained and information furnished to member roads at that time was so late in reaching the proper operating officer as to be of no use whatever. If that was the case in the small New England field, what would be the results if the entire continent were put under one central officer? The delay in getting information and the large force employed in recording movements would put the records so far behind as to render them useless in checking delayed cars or answering inquiries. At the present time some few of the larger roads find it necessary to maintain both a day and a night force of clerks in car record offices and even then they work the clerks Sundays to keep the records up. What would be the condition if this was multiplied ten-fold? In the future we may have a clearing house for recording movements, but for the present it would be a great saving if used only for settling car hire and ticket interchange accounts.

With the adoption of per diem the chief despatchers will have to have a copy of agents' on-hand reports each day showing each and every car on hand, time held and cause of delay; this in order that he may control the expense and dispose promptly of cars not required for immediate use.

A much improved system must be devised and used in Yardmaster's or Terminal Superintendent's offices at all large terminals, so that the records will show not only the receipt and departure of cars, but also show each and every movement from one district to another within such terminal. Current records must show in graphic or in a brief manner the total number of cars of each commodity for each important consignee on hand at all times; the time such cars have been stored and why. A check showing that cars have been promptly and properly placed on designated tracks must be provided for the Yardmaster. He must also have a check showing the time that loaded or empty cars are held after they are ready to go forward, and the cause of such delay. Also a check or report showing when the cars of any commodity for any consignee are accumulating beyond his capacity to unload, in order that the Superintendent may be advised to diminish the supply of cars at loading points.

Three other features are necessary: (1) A printed switching order showing date and time the order is placed, the service required, and the time the service is finished; by which crew and engine. (2) The assignment of track space for each consignee or commodity, and the enforcement of rules governing the placing of cars where they belong. (3) The Superintendent of Terminals to be in fact General Manager of the Terminals, and wholly responsible for the service therein.

This may, in the minds of some, appear visionary; may seem to be too high a standard. Let us follow it up and determine if such is the case. At the present time you afford unlimited switching power and crews in the passenger yard. Each train arriving is checked immediately and the numbers of the cars taken to the Yardmaster. The train is pulled out of the shed and placed on an assigned track, after cutting out any extra cars. The extra cars are placed on tracks assigned for such cars. A check of cars in the extra yard is made two or three times a day, so that the Yardmaster can at all times tell you from memory how many extra baggage, mail, express, combination, smoking, first class or sleeping cars he has on hand. He is always in position to meet any emergency that may arise. Why should not the freight terminals be organized on the same lines? Surely, the loss of a few passengers for want of an extra coach on a train one day in the month is not worth mentioning beside the loss of hundreds of cars of freight each day or week. Or is it that managers can see mistakes or failures more clearly in a small passenger yard than in a large freight terminal?

It is a plain business proposition to use these same methods in organizing a freight yard. When a train arrives, mark and card the cars at once. Then place the cars on assigned tracks where they belong. Any cars for hold orders should be reported to the Yardmaster, who will take them up at once for disposition orders, or reference to a superior officer. Bad-order cars will be placed on the tracks assigned them, and with only one handling. The Yardmaster who thinks that unless he personally directs each movement on the ground it will not be properly made, should be made to see that he is neglecting 14 switch engines and crews at one time in order to direct the movement of one. The time has long since passed when a powerful voice and physique are the main qualifications of a yardmaster. What the present requires is mental qualification, the power to organize. The great city terminals are now so large that the yardmaster cannot be everywhere at the same time, as of old. At the same time the telephone enables him to give directions at any time for immediate movements anywhere, and to be conversant with conditions at all times.

What advantage is gained in running freight at high speed if it is to stand 12 or 24 hours at a terminal waiting to be placed for unloading? I have given much space to terminal organization, as it is the key to successful operation under the per diem system. This branch of the service requires strengthening at nearly every point on the continent.

A new departure was made a short time since on a prominent group of roads, and is proving a complete success; far greater than even its originator anticipated.

(Continued on page 26.)



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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

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We publish in this issue a useful contribution to the "per-diem" discussion, in the shape of an article from Mr. J. M. Daly, who shows the weakness of some of the arguments which are brought forward in disparagement of the proposed reform and emphasizes the need of dealing with car service problems in a thorough and comprehensive manner. The proposition to more systematically organize the work of handling cars in large freight yards is bold, and its adoption will involve considerable expense; but it is, in our opinion, of the highest importance. A significant lesson from Mr. Daly's experience is that the introduction of per-diem rates will tend to compel the abolition of uneconomical practices. This confirms in practice what the most competent car-service men have deduced by reasoning, that freight cars when away from home ought to be paid for by the day instead of by the mile, is being recognized by more and more railroad officers every day; and it is scarcely necessary that we should argue it. The question that most engages attention now is not whether the change is desirable but rather how it can be carried out. Interest in the subject is now more general than for several years and the prospect is more hopeful than ever before. Mr. Daly needs no introduction to readers who have taken an interest in this subject in the past, as his experiment with per diem on the Illinois Central, which has been described before the New York Railroad Club and elsewhere, was one of the most valuable contributions to the general knowledge on the subject. He has been a thorough student of the work of the car service superintendent, and has tested his theories in actual practice. It will be noted that he deals very directly with the most prominent objection presented in our last article (December 13). If we may credit a recent press despatch from Montreal the question of careless or dishonest accounting is not by any means a dead issue in connection with car interchange. The despatch says that the Grand Trunk recently discovered that a connecting line had omitted to credit the G. T. with 300,000 miles of car-service, all within a few weeks.

The Ton-Mile in England.

It is announced that the North Eastern Railway of England will hereafter keep ton-mile and passenger-mile statistics, and the British papers take the matter very seriously—each after its kind. The *Statist* looks on this kind of information as of "vital importance to our railways," while *Herapath's* sees in it merely a useless addition to clerical expenses. As is generally the case in human affairs, the truth lies between these views. We have no notion that Mr. Gibb, the accomplished General Manager of the North Eastern, looks on ton-mile statistics as being of vital importance. He knows that British railroads can go on and serve

the public, and make money, and improve the amount of service and kind of service, and reduce the cost of service, without knowing the average cost of moving one ton or one passenger one mile. He knows thoroughly well where the advantage lies as between statistics without sense and sense without statistics. He has no illusions as to what *Herapath's*, with gentle courtesy, calls "Mr. Gibb's statistical nostrum." On the other hand, he knows that a knowledge of accurate statistics of the fundamental traffic units may, if wisely used, be made worth many times the cost of collecting the knowledge.

In truth we may doubt if those who talk so much about the value or futility of ton-mile or passenger-mile statistics always know what they are talking about. We are disposed to think that the greatest value of collecting these statistics has been indirect; that the great value has been in making men think. Their intellectuals have been set working, and then the results have been produced; but it is doubtful if the mere knowledge of ton-mile rates or ton-mile costs has directly led men to try to put one up or bring the other down. Men have striven to get the best rates they could, and these rates have been governed by commercial conditions and by competition and not by any knowledge of the ton-mile rate; and the margin between profit and loss is so low that railroad officers need no other incentive to try to reduce costs. Furthermore, the elements of cost are many and complicated, and can only be approximately distributed at best, so that we really do not know what it costs to carry one unit of traffic. For example, to ask some very ancient questions, who knows what part of the cost of the upkeep of track and structures should be allotted to passengers and what to freight? Who knows what part of the expense of carrying on country stations should be charged to freight and what to passengers? A conventional distribution has been adopted, but if the distribution is inaccurate it is misleading, and to that degree the supposed knowledge of unit costs is not knowledge, but is error and leads to error in the results.

But, after all, this is hair splitting, and the important fact remains that something has stirred American railroad men, from presidents down to conductors, to great intellectual activity. They take their business with a keenness that is not found among railroad men in other countries; and no doubt the talk about unit costs and the contemplation of comparative unit costs, have something to do (perhaps a great deal to do) with this intellectual activity, at least among the higher officers.

The story of the ton-mile is not unique. Many years ago some one began to use the ratio of working cost to gross earnings as a measure of efficiency; and to this day there are men who will tell you that the railroads of the United Kingdom are worked for 62 per cent. of their gross earnings, while it costs 64 per cent. to work the railroads of the United States; or that the Delaware, Lackawanna & Western is worked for 56½ per cent. while it costs 70¼ per cent. to work the Erie. Within a year we have actually been asked to analyze and expose the inefficiency of the Erie on this very basis. We have too much respect for the intelligence of the readers of the *Railroad Gazette* to take the time and space now to point out the fallacy of this method of comparison.

Long ago we began to watch the average train load on some given road as a clue to improvement in its management, and to extend this to comparison among roads working under nearly like conditions. Now, most of the writers on railroad accounts and results apply this yard stick with perfect impartiality. The judicious student knows that before we can compare train loads on different roads we must agree on a definition of a train. On one railroad only revenue freight is considered, and on another revenue freight plus company freight is taken; on one railroad the train load is computed by using only the miles actually run by freight trains; on another is included the mileage made by every engine with a caboose; on another is included the mileage made by all helping engines. Perhaps a double-headed train is counted as two trains, perhaps as one. Again, the average train load on the New York, New Haven & Hartford is 208 tons, on the Chesapeake & Ohio it is 511 tons. But that does not prove that the New York, New Haven & Hartford is inefficiently worked. In the one case there is a great movement of high class freight, which must be despatched and got through promptly; in the other the greater part of the freight movement is coal, and the percentage of very heavy, slow trains, moving with full load, is high. Thus we see that the indiscriminate comparison of average train loads teaches us nothing and it may mislead us. If we know and weigh the local factors it is an excellent test of the compara-

tive efficiency of working; but if we do not know and weigh these factors we draw wrong conclusions.

What has been said of the use of percentage of net to gross, and of the use of the average train load, is just as true of the other units of performance, namely, the train-mile, the engine mile, the car mile, and the ton-mile.

In the early seventies Mr. Albert Fink (and we may properly add, the then editor of the *Railroad Gazette*) started for us in the United States the modern theory and method of analyzing the cost of work on railroads. Mr. Fink's introduction to the annual report of the Louisville & Nashville Railroad Company, in 1874, is a classic. In 48 octavo pages he formulates and develops the principles which underlie the study of the cost of transportation by railroad. He shows us the necessity of knowing the ton-miles if we would know what we are doing; and then he shows us how far astray we may go if we undertake to compare averages.

The ton-mile is the ultimate measure of transportation produced. The ton is the unit of quantity; the mile is the unit of distance. The product of quantity by distance is the unit of transportation. Cars multiplied by miles, or trains multiplied by miles, do not measure the effective work. Therefore, if we wish to know what we have accomplished, we must know this product of quantity by distance. The ton-mile tells us just what we are doing; it does not, however, tell us what energy we have expended in doing it. For our own use, in running our own railroad we must know the amount of work done; but from still other records we must ascertain the energy expended. Then we can know the cost of the unit of product. This accurate knowledge and analysis will help us to discover where cost may be reduced. It will help us to compare one year with another on any one division. It will help us to compare one division with another. It will help us to compare one railroad with another.

But here comes in the danger of averages. Mr. Fink says "a careful investigation shows that under the ordinary conditions under which transportation service is generally performed the cost per ton-mile in some instances may not exceed one-seventh of a cent, and in others would be as high as 73 cents per ton-mile on the same road. The lower cost applies to freight carried in cars that otherwise would return empty; the higher cost to freight in small quantities carried short distances." And again he says, "A mere knowledge of the average cost per ton-mile of all the expenditures during a whole year's operation is of no value whatever in determining the cost of transporting any particular class of freight, as no freight is ever transported under the average conditions under which the whole year's business is transacted." He found that on the main stem of the Louisville & Nashville the cost per ton-mile, including operating expenses and interest, was 1.7804 cents; but on the Glasgow Branch it was 19.0983 cents. We shall not now attempt to explain why a difference so great was found on different parts of the same road, but simply state the fact that it was found.

For the month of May last Mr. Gibb, of the North Eastern, caused detailed particulars to be noted of each individual consignment of goods and minerals, giving weight, distance and receipts. He found that his ton-mile rate was 0.99 pence for the mineral traffic, or, say 1.98 cents. He found that his average rate for goods was 1.642 pence, or 3.282 cents per ton per mile. On the Chesapeake & Ohio the average rate for coal per ton per mile last year was 0.272 cents; the average freight rate, excluding coal, was 0.525 cents. On the face of it there is an enormous difference in these rates; if we had the cost at which the business was done we should probably find a similar difference, but such a comparison is entirely worthless. The North Eastern is a great coal carrier, the greatest, we believe, in Europe. It carried, last year, 41¼ millions long tons of coal. The Chesapeake and Ohio is also a great coal carrier, 53 per cent. of its tonnage being coal. But the average haul of coal on the North Eastern is, we believe, about 16 miles. The average haul of all freight on the Chesapeake & Ohio is 301 miles, we have not the coal haul. If the cost of handling at the terminals were the same in each case that element, while imposing the same actual tax on each ton, would impose a tax possibly twenty times as great per ton-mile on the North Eastern as on the Chesapeake & Ohio. In other words a comparison is interesting, but it has no practical value, and proves nothing for or against the relative efficiency or economy of the two roads.

In brief, we should say that ton-mile statistics will help the British managers to further economy in working their roads; but we should say further that

he would be an injudicious man who would try to prove anything by comparing their ton-mile statistics with ours. Only by keeping ton-miles and passenger-miles can they know exactly what they are producing; and obviously they cannot know what their product costs until they know what that product is.

The reports of advances in the wages of yard and road trainmen on various railroads, which we mentioned last week, appear to have been somewhat exaggerated by the enthusiasm of the reporters. But there have certainly been substantial increases in the pay of conductors and brakemen in yards, and the fact that one road is to increase the pay of its yard men at such a center as Chicago gives assurance that all of the roads centering there will make similar advances. The officers of the Pennsylvania Railroad persistently deny that they have made or will make any general or uniform advance in pay, though at the same time they are careful to say that the wages of men in the train service throughout the company's lines are being "adjusted" so as to remove inequalities. It has been found that different standards prevail on different parts of the company's system. Whether or not this refers particularly to the Buffalo & Allegheny Division, the most recent acquisition of the Pennsylvania, does not appear. Local newspapers, getting their information from the employees themselves or from local officers, seem to be satisfied that practically all of the men in the train service of this company will receive from 5 per cent. to 10 per cent. increase. The situation on the Pennsylvania Lines West of Pittsburgh appears to be the same as the foregoing, and the Logansport (Ind.) *Journal* prints a list of revised rates of pay for engineers and firemen on the P., C. & St. L., which fills a column, and the statement is made that these rates are 10 per cent. above those heretofore paid. The changes on the B. & O. are substantially as reported in our last issue. An officer of the road writes: "Yard rates were advanced on an average about five per cent. Road firemen's wages on the heavier engines were increased from \$2.125 to \$2.25 per 100 miles. The position of flagman was created and the pay will be five per cent. higher than that of other brakemen. Overtime in the freight train service will be paid for on a 10-miles an hour basis, instead of after 12 hours. This will result in an increase of about five per cent. in wages, in addition to the other advances." This statement about the increase in yard men's pay—an average of about five per cent.—is the only official information that we have received which applies to Chicago. The manager of one road entering Chicago writes that no general advance has been made by his company.

The agreement to issue no exchange passes appears to be well maintained thus far. The officers of the roads west of Buffalo and Pittsburgh evidently have been more inclined to relax the agreement than those farther east, and those traveling men who have the ear of the reporters have kept up a big hue and cry in the newspapers, but thus far without effect. The Pere Marquette and the Wheeling & Lake Erie are said to have sent passes to the officers of other railroads, but these appear to be the only exceptions. The roads west of Chicago, who have large numbers of traveling agents in eastern territory, have told these agents to be economical in their expenses, to buy mileage tickets or such form of transportation as may be the cheapest, etc., but do not seem to have made any other change in instructions. One of the space writers reports that the president of one particular trunk line is generally believed to have been the prime mover in getting the no-pass agreement adopted and that, to punish him, the agents of the western lines are diverting freight from his road; but it remains to be seen whether there is any foundation for this story. Some of the rumors have it that traveling agents will be expected to make better use of the telephone and telegraph and thus save some of their journeys.

No action is thus far reported in Congress in connection with the proposals to amend the Interstate Commerce law, and there does not appear to be any material change in the situation in any quarter; but the millers and others who held a convention at St. Louis have got themselves noticed during the past week by getting the newspapers to print the full text of the bill which they are going to ask Congress to pass. It contains no features that have not already been discussed, over and over. The Interstate Commerce Commission is holding public hearings in Chicago and St. Louis this week, and a Chicago newspaper says that the inquiry will cover the whole field of railroad regulation, including the nature and probable effects of railroad combinations, like that of the Northern Pacific and Great Northern, and that the facts gathered are to be used by President Roosevelt as the basis of a message to Congress. Subpenas were issued requiring the freight agents of a number of large shippers to appear at the hearing, and numerous railroad officers are said to have been "requested" to attend.

American Locomotive has announced to an intended buyer of locomotives that the earliest deliveries could not be made before ten months.—*Wall Street Journal*. Now is the time for the British locomotive builders to get back at us. We have been told a good many times that orders came here mostly because the British builders were too busy to make prompt deliveries. Now they

ought to send their agents over here and take contracts to be delivered in six months. That would add to the interest of life and to the gaiety of nations.

NEW PUBLICATIONS.

Who's Who in America. A Biographical Dictionary of Notable Living Men and Women of the United States. Edited by John W. Leonard. Octavo, 1,304 pages. Chicago: A. N. Marquis & Co. 1901.

As soon as a man's head begins to appear above the water he is promptly assailed by people who want to publish accounts of his distinguished and useful life in biographical directories or dictionaries, or cyclopedias, frequently with a portrait, and very often for a more or less important money consideration. Consequently, the sagacious man learns to promptly throw into the wastebasket all circulars and letters relating to such publications. We are quite sure, however, that "Who's Who in America" should not be treated in this way. The work is really a serious one and has evidence of being carried out in good faith. We never heard of anybody being asked to subscribe for it if he did not want to, or of anybody's name being kept out of the list because he did not subscribe. The selections seem to be as discreet and as complete as one could reasonably expect in a publication so young as this. Doubtless some names will be left out as time goes on and many more added. The notices are very condensed and there are no portraits. A few tests in actual use have shown the work to be accurate, so far as those tests have gone. The first edition of this dictionary appeared in 1899 and the purpose was to make it in a comprehensive way a general biographical dictionary of notable American contemporaries. It contained then 827 pages and 8,602 names. This edition contains 1,304 pages and 11,551 names.

The Engineering Index for Five Years, 1896-1900. Edited by Henry Harrison Supplee, B. Sc. Large octavo, 1,030 pages. New York and London: The Engineering Magazine. 1901. \$7.50.

This is Volume III of the Engineering Index, which began with the year 1884, and is now brought up to 1900. Vol. I and Volume II were published by the Association of Engineering Societies under the direction of Prof. J. B. Johnson, and the present publisher has very appropriately introduced a good portrait of Prof. Johnson as a frontispiece to Volume III. The two earlier volumes are now nearly out of print, and as they were not electrotyped will not be reprinted. They may be had at \$5 each, and with the three the field is pretty well covered from 1884-1900 inclusive. The monthly continuation of the Index since 1900 will be found in the successive issues of the *Engineering Magazine*. The publisher is now arranging Vol. IV, covering the year 1901, and expects to issue yearly volumes hereafter. Prof. Johnson gives a short account of the origin of the Engineering Index by way of introduction. The Editor's preface informs us that while Volume II contains about 600 entries taken from 62 journals, the present volume contains nearly 40,000 entries, taken from nearly 200 sources. The arrangement of the index seems to us good. In the first place, certain catch words have been chosen and these run through the volume alphabetically, appearing at the top of the page. Under each of these are references, also arranged alphabetically, each with regard to its class; for example, the word *Bridge* will be found at the head of 15 pages and underneath this are 500 entries, beginning with *Aesthetics* and ending with *Zurich*. The index cannot fail to be of great use and the publisher has earned our gratitude by his enterprise.

Transactions of the American Society of Mechanical Engineers. Volume XXII. 1901. New York: Published by the Society, No. 12 West Thirty-first street. This volume of the Transactions contains 1,164 pages, including the index. The volume covers the forty-second meeting held in New York City, in 1900, and the forty-third meeting held at Milwaukee in 1901. The papers included run from No. 867 to No. 913, and the illustrations are 485 in number. Obviously, it would be quite impracticable to attempt to say specifically what the volume contains.

The Railroads—The Situation and a Forecast.*

BY H. G. PROUT.

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One is tempted to say that the railroads of the United States have now fairly entered on the most important epoch in their history. But, having in mind the danger of superlatives, and looking back at various other railroad epochs which have been seen since the Civil War, we will only say that this is a very important epoch. It is doubtless the serious and definite beginning of an era of systematic consolidation. This era has long been foreseen and predicted; a few men have had the foresight and the courage, the ability and the opportunity to profit by its approach.

On April 5, 1887, the Interstate Commerce act went into effect, and in July, 1890, the Anti-Trust act became a law.

The rulings and the activities of the Interstate Commerce Commission, and the decisions of the courts under the anti-trust law, gradually but inexorably destroyed the power of the railroad companies to enter into effective agreements among themselves to regulate rates, car service, and other conditions of their relations to the public. But those who appreciated the situation realized

thoroughly well that such regulation was necessary for the preservation of the railroad properties and for the health of society itself.

All intelligent and informed men now know that one of the most unwholesome elements in trade and industry is the uncontrolled competition of the transportation companies. So it was obvious enough that competition must be controlled and regulated. The individual railroad companies were forbidden to make pools or other restricting agreements; commission control, State and National, had broken down, at least on this side; Government ownership is still a remote and purely academic suggestion in this country.

Concentration of ownership was the one obvious resource left. Many people realized this, but certain bold and sagacious gentlemen not only realized it, but proceeded to make money out of a new chapter in applied political economy. Thus came into action that principle which is conveniently spoken of as the community of interest idea.

An earlier group of consolidations was made by certain men of genius, particularly Vanderbilt, Thomson, and Scott, but those consolidations were based upon another set of notions. They were made to the ends of efficient operation and command of territory. They created great values not only for the stockholders, but for the communities, by reducing cost of operation, increasing the amount of service, and raising its quality. The late combinations contemplate none of these things as primary objects. It is questionable if they reduce cost of operation or improve service. Surely they will not do these things directly; and still they are none the less an orderly and apparently an inevitable step in social evolution.

So far as we can see they offer the only practicable means (if the law remains as it is) by which may possibly be swept away all the evils of discriminating rates as between places or persons, of unstable rates, of secret rates and rebates, of wasteful accommodation in the use and abuse of cars, and all the vicious train of consequences which flow from the uncontrolled struggles of the commercial staff of the railroads. And it must be kept in mind that these evils affect the traders quite as seriously as they affect the railroads. They are specially hard on the honest trader and the smallish trader—the yeoman of commerce. In the last dozen years it has become axiomatic that society wants equal and stable rates before it wants merely low rates. Any merchant who has reflected on the subject will tell us this.

The public has been kept pretty well informed of the nature and extent of the recent great combinations. It is but a few months ago that the Union Pacific got control of the Southern Pacific—carrying with it the control of the Central Pacific also. The same interests owned the control of certain Mississippi Valley lines aggregating 1,750 miles. This one stroke, therefore, brought together about 17,000 miles of railroad. Then came the Northern Pacific-Great Northern-Burlington-Union Pacific fight, ending in the Northern Securities Company and an exchange of Directors and a division of the control of the Burlington. This exciting episode brought into substantial agreement the interests owning and controlling over 35,000 miles of railroad. It left out but two roads to the Pacific Coast, the Canadian Pacific and the Atchison.

But before these things happened in the West quite as important things happened in the East. The Lake Shore, the Michigan Central, and the New York Central had long been in one control, but now the New York Central actually bought those properties and leased the Boston & Albany, and the Vanderbilt lines worked from Boston to Council Bluffs, to St. Paul and the head of the Lakes, to St. Louis and Cincinnati, and to Newport News. The Pennsylvania bought control of the Long Island and the Baltimore & Ohio, and bought an interest in the Norfolk & Western and in the Chesapeake & Ohio, and further solidified the peace by giving the New York Central an entrance into the anthracite coal fields in Pennsylvania. Many other things have indicated the substantial agreement of these two most powerful companies.

While this was going on the Erie got control of the Lehigh Valley and of the Pennsylvania Coal Company, and the Reading got the Central of New Jersey. Another important combination of interests was made in the building up of the Seaboard Air Line, which, however, does not appear to be in the community of interest group.

Underneath these visible changes of ownership and of control, and these known interlacings of interests, there runs a subterranean current, the extent and power of which very few men in the world know. It is morally certain, however, that the influence of the great banking houses and of certain strong individual investors has been spreading through the railroad system, carrying the community of interest idea far beyond the limited circle of consolidated ownership. But still the greatest part of the railroads of the United States is left out of the circle of consolidated ownership and perhaps outside of the zone of effective influence by the unmeasured current of which we have spoken.

Up to this time what has been the net result of the community of interest? Much has been attributed to it—more, we judge, than belongs to it. It is obvious to any one that if the control is concentrated in fewer hands it is easier to unite on a common policy. Perhaps it would be eight times as hard to get four men to agree as to get two men to agree; perhaps the difficulty grows

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as the cube of the number of men concerned; perhaps the difference is even greater. So it is assumed that one result of the community of interest will be to keep up open rates; that another result will be to do away in great part with secret rates and with the divers illegal and pernicious ways of discriminating. The assumption is perfectly reasonable and highly probable; but how far is it yet justified?

The average rate for one ton of freight one mile since 1892 has been as below:

	Mills.		Mills.
1900.....	7.29	1895.....	8.39
1899.....	7.24	1894.....	8.60
1898.....	7.53	1893.....	8.78
1897.....	7.98	1892.....	8.98
1896.....	8.06		

The rate was probably still higher in 1901; but everything else has risen. So far we have nothing but theory to prove that the higher rates can be kept with a falling tonnage. The test of the strength of the alliances and understandings so far established will come when hard times come again. Secret rates and rebates of all sorts have not disappeared, and some big traders tell us that they are worse than ever. That we doubt; but that they exist we do not doubt. The great difficulty now seems to be with the small, independent roads, which by their perverted ingenuity in routing freight "all around Robin Hood's barn," and by other wicked devices corrupt and lead astray the good traffic managers of the community roads. All this proves nothing against the community of interest plan; it has not been carried far enough.

While all the tremendous combinations have been going on the railroads have been doing much the biggest business in their history, and it has been sustained for four years. In spite of the low rates they have made a great deal of money, and, profiting by hard experience, they have divided only a reasonable part of their profits. Many shareholders say that the part divided has been unreasonably small. Great sums from earnings have been poured into improvement of road, structures, and rolling stock. Taking advantage of high credit other great sums have been procured from issues of stock, bonds, and car trust certificates and devoted to the same purposes. It is quite impracticable to estimate the expenditure on permanent betterments that will have been made in the five years ending June 30, 1902, but it will add some hundreds of millions to the real value of the railroads of the United States. In the meantime great refunding operations have been going on, increasing the volume of bonds, giving cash for betterments, and at the same time reducing interest charges.

Such, very briefly, are the broad characteristics of the epoch on which the railroads of the United States have fairly entered. Now, what is before them?

If what we have said is true we may expect still further consolidations. That is the first great probability for the lawmaker, the student, and the investor to keep in mind. Second, we may expect some further reduction in the cost of doing business. The physical improvements now going on are calculated to that end. Third, we may expect continued heavy business for a year yet, but beyond that it is not worth while to try to predict. One's prediction must be mostly a matter of temperament. Fourth, we are justified in expecting fairly well-maintained rates as long as business is good, and rates better maintained than they have been for many years past after business has seriously declined, simply because fewer men are concerned in directing affairs. Finally, we may expect a solid resistance to the assaults of adversity when the adversity comes.

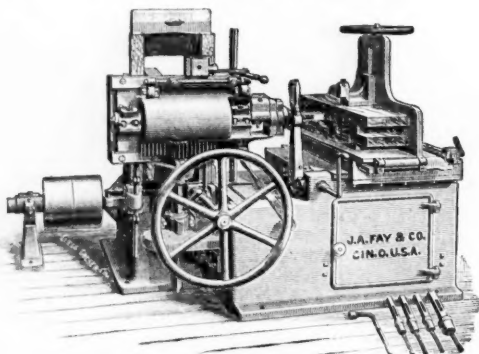
Probably the railroads of the United States as a whole were never in a sounder condition than now. Generally speaking, capital has not been inflated in the recent operations; actual values have been created and increased; a way to co-operate has been opened. All of this has been accompanied by some disagreeable features and in a few instances by inflation and other dangerous features, but there is a big balance on the right side of the books.

A New Hollow-Chisel Mortiser and Borer.

The J. A. Fay & Egan Company, of Cincinnati, have recently put on the market a new machine, adapted to working large timber. A description of some of its features follows:

It will cut a mortise from 1/4 to 10 in. deep, in either hard or soft wood; will make end tenons, gain or mortise clear through a 10-in. timber, and will also counter-sink for bolt heads. It will also take stock to 16 in. wide, 15 1/2 in. deep, and will cut a gain at the top of a 13-in. timber.

The cored column is strongly braced and the bed



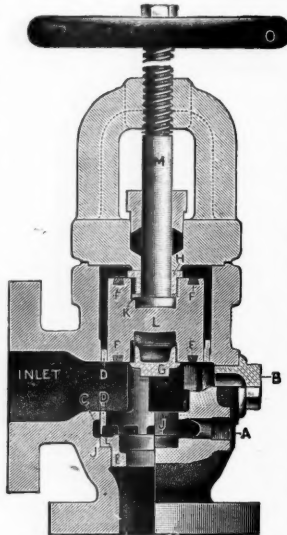
Automatic Hollow-Chisel Mortiser and Borer.

rests on the main column, held by gibs and fitted with stops to gage depth of mortise. It can be moved endwise for long mortises, and is fitted with adjustable stops to regulate their lengths.

The chisel frame and its chisel and auger are adjusted to different heights, by a hand wheel, stops being provided to gage the movements of the chisel, with locking device for holding it in position. Its reciprocating motion is produced by gear operated in rack at its side, with driving force near the chisel line. The forward and backward movement is perfectly automatic, and under instant control of the operator.

The "Duro" Blow-Off Valve.

The illustration shows a sectional view of an improved blow-off valve made by the Lunkenheimer Co., Cincinnati, Ohio. It is designed especially to prevent scale from lodging upon and cutting the valve and seat. The following description makes the valve's operation and advantages plain:



There is a steam inlet A connecting with an annular passage C. The iron body of the valve has a brass casing D with circular slot J cut into the side below the level of the seat E. This casing D is held in place in the valve body by the seating E, both of which are removable for repairs or replacement with new parts. The opening A is connected to the steam part of the boiler and a suitable valve interposed. The object of this steam inlet A is to admit steam to C and J, and discharging from the latter blow across the seat, which will clean off any scale or sediment that may have accumulated on it, so that the disc and seat bearing, when in contact, will be perfectly clean. To close the valve the disc is screwed down in the usual way. As it approaches the level of the inlet the edge of the disc passing the lower edge of the casing D cuts off a great deal of the flow of water and sediment. At this time the valve in the steam pipe leading to inlet A should be opened and the steam admitted to the annular space C, from whence it passes through slot J and blows off the entire surface of the seat E. In the meantime the disc is being screwed home to the seat, which also cuts off the flow of steam from inlet A as well as the blow-off from the boiler. The valve in the pipe leading to inlet A can be left open at all times, as the disc of the blow-off valve would keep this outlet closed.

The Per Diem Basis for Settlement of Freight Car Hire.

(Continued from page 23.)

It was the establishment of the office of Traffic Director; a man in charge of all traffic matters affecting allied roads in the routing of freight and control of rates. Would not the same principle applied to operating departments result in an increased car performance and a decreased empty haul? Why not the Transportation Director? The writer was connected with a road interchanging freely with several lines, all practically under one control; and he frequently received orders for cars to go west empty over one road when its parent line was at the same time hauling similar cars empty eastward. These cars could have been turned over, at or near the loading point, to the road wanting cars; and they would have been so turned if one controlling head had had charge of all. There is a great opportunity to utilize special cars such as flats, ballast and refrigerator cars, steam shovels and engines, and get the maximum service on some of the large systems now owned in "community of interest," but still worked by separate managements, by directing movements from one to the other, as conditions so require, by one controlling officer. This could be done while yet maintaining the same organization as at present.

The Cast-Iron Wheel.

Mr. Fawcett, of St. Charles, Mo., has sent to some of the iron and steel papers a letter on "the alleged decadence of the cast-iron car wheel." The ground traversed is mostly such as our readers have been made pretty familiar with by discussions in this journal, but we reprint a few extracts from the letter:

"Railroad companies seeking the highest efficiency in their equipment should not compel the producer to take back other makers' products, but they should insist and demand from each and every maker that he use only a small per cent. of old wheels and only the highest grades of pig iron, low in sulphur and phosphorus; that the different grades should be well and thoroughly mixed in accordance with the latest and best perfected methods of modern foundry practice; that no new wheel should be regarded as satisfactory in which the phosphorus

showed above 0.325 per cent.; that the sulphur be kept down, and in no case be allowed to run over 0.070 per cent. Above this it hardens and makes the wheel brittle and rotten.

A new wheel, when the depth of the chill is controlled by these two elements, will not make satisfactory mileage, neither is it a safe and reliable wheel at all times. A first class wheel, if carefully made, is not necessarily high in sulphur, but after it has made its mileage on the road and returned to be again remelted with other makers' high sulphur wheels, the chances are that it picks up enough sulphur to destroy its usefulness, as this element generally increases with each remelting in the best conducted cupola practice. This continual interchange and remelting of old wheels increases the sulphur, and duplicating them into new ones without a proper proportion of new iron or without any definite regard to chemical composition is little better than a crime. Continuously remelting old wheels in a cupola month after month and year after year, the product has gradually degenerated by the absorption of sulphur from the fuel and other natural causes, until some wheels are at present saturated with this element and are no more reliable to remelt.

"There is a certain amount of self-sustained assurance manifested among wheel makers with an established reputation, that they can produce a longer lived and a more reliable wheel than they are at present making, if they are paid a fair price for their product and allowed to use their own judgment in selecting a suitable pig iron. Every practical wheel maker knows that high sulphur and high phosphorus make a hard, brittle and weak iron, and when the depth of chill is controlled by these two elements its life and strength are gone. High sulphur and high phosphorus may be two very desirable elements in some castings, but not in car wheels.

"A practiced eye can readily detect all high sulphur chilled wheels from those chilled by low silicon. After a critical inspection of the chill plates and other well known imperfections from which it was condemned, the sulphur contents can be readily told within a few points.

"The writer has made a practice for several years of selecting a piece of a high sulphur test-broken wheel, with the maker's name on it, and showing the defects that this element causes after the wheel has been in service a short time, until we have quite a collection of pieces from all makers with an established reputation. After having a careful analysis made from each piece, we retain it for future reference just to show that the best brewers sometimes make bad beer, and that the only way to make good wheels is to make no bad ones.

"The writer was privileged to receive from a railroad official shortly after a lamentable accident occurred on his road, two complete analyses and a piece of the wheel which broke under a passenger coach while the train was running at a high rate of speed. The result was a disastrous wreck in which eight persons were killed and several others more or less seriously injured.

"The following are the analyses furnished by two of the most expert railroad chemists in the country, which we will call No. 1 and No. 2:

	No. 1.	No. 2.
Total carbon	3.73	3.72
Graphite carbon	2.63	2.59
Combined carbon	1.10	1.13
Manganese	0.37	0.35
Phosphorus	0.366	0.361
Silicon	0.72	0.72
Sulphur	0.169	0.172

"A prominent railroad some time ago allowed to be published in the trade papers the analyses of several wheels selected from the principal wheel makers in the country. As authority has considerable weight with some minds, we will give the three analyses as published at the time:

	No. 1.	No. 2.	No. 3.
Total carbon	3.65	3.72	3.68
Graphite carbon	2.41	3.08	2.54
Combined carbon	1.24	0.64	1.14
Manganese	0.31	0.32	0.19
Phosphorus	0.53	0.42	0.39
Silicon	0.57	0.47	0.88
Sulphur	0.16	0.16	0.16

Some Pretty Good Old Rules.

The *South Wales Daily News* has come into possession of a relic of the early days of railroads in England in the shape of a copy of the rules and regulations of the Taff Vale Railway Company of nearly 50 years ago. The Taff directors in those days set great store by the personal appearance of their servants, for by rule 12 every person is ordered to come on duty "clean in his person, shaved and his boots blacked," and the board of 1854 directed that "all persons, especially those in uniform, are to keep their hair cut." Thus, "Persons upon joining and while in the company's service are not to be in debt, no matter of how small the amount or where it may be accumulated, nor are they to be bonded, bail or security for any person." Again, "Any person that has at any time been a bankrupt or an insolvent . . . will not be taken into the employ of the company." Rule 265 laid it down that "no person can be taken into or kept in the employ of the company if he be in debt at the time of his application or subsequently."

Rule 395 enjoined that "all persons wearing uniforms are at all times when walking or standing to keep their persons erect;" while another forbade the servants of the company having their hands in their pockets or "appearing in the least indolent while on duty." Still another rule prohibits lolling against any wall, passage, door, etc. Rule 26 was: "It is urgently requested that

every person, whether on or off duty, shall conduct himself in a steady, sober, honest and creditable manner, and that on Sundays and other holidays when he is not required on duty, that he will attend a place of worship, as it will be the means of promotion when vacancies occur." By rule 42: "Not any person is allowed to receive any gratuity from the public on pain of dismissal."

Rule 50 is: "Smoking by any passenger, whether he be a company's servant or not, or by any person whether in the employ of the company or not, upon any part of the company's premises, or in any carriage or train, is strictly forbidden, whether such person be traveling or otherwise." By rule 311 "Persons having passes are to ride in the fourth wagon from the last in the train, and at all times in sitting position upon the bottom of the wagon."

TECHNICAL.

Manufacturing and Business.

On and after Jan. 1 C. L. Robinson will be connected with the Chicago office of the Detroit Graphite Mfg. Co.

The Augustin Fuller Co., of New York city, was incorporated under the laws of New York State, Jan. 6, with a capital stock of \$50,000, to make railroad supplies.

H. M. Heath, of Augusta, president of the Stevens Air Brake Co., which was organized under the laws of Maine in December, to make an air brake for street cars, tells us that they are having their brake tested upon a street railroad in Augusta.

The Pittsburgh Friction Draft Gear Co. was chartered in Pennsylvania, last month, by Wm. M. Orr, Wm. D. Rowan, Boyd S. Lethart and Wm. A. Harrison, all of Allegheny, and Wm. W. Woodcock, of Canton, O. J. M. Schoonmaker, of the Pittsburgh & Lake Erie, is said to be one of the promoters of this company which has patents for a coupler attachment. The plant, it is said, will be located in Allegheny, and will cost \$300,000.

The Car Wheel Trueing Brake Shoe Co. was incorporated under the laws of New York State Dec. 21, with a capital stock of \$100,000, half of which will be preferred and the remainder common stock. The object of the company is to make car wheel trueing shoes and other railroad supplies. The general office will be in Buffalo, and J. Black Perry, of Toronto, Ont., Walter D. Ingham and Clark L. Ingham, of Buffalo, are the directors.

The American Air Brake Connection Co., with a capital stock of \$100,000, was incorporated in New York State, Dec. 19, to make all kinds of connections and parts for air-brakes, signaling pipes, steam pipes and hot water pipes used on locomotives and cars. The principal office will be in New York City. The directors are all of New York City: Daniel P. Smock, 120 Broadway (Room 40); Louis E. Carman, 100 Broadway; Frank A. Pollard, 301 Mott street; Peter D. Sturges, 120 Broadway; John G. Ritter, 87 Nassau street.

On and after Jan. 15, 1902, the General Sales Office of the Pennsylvania Steel Company, and Maryland Steel Company will be in Philadelphia, and all communications regarding sales, shipments, etc., should be addressed to H. F. Martin, General Manager of Sales, the Pennsylvania Steel Company, Girard Building, Philadelphia, Pa. A local sales office will be retained at the plant of the Pennsylvania Steel Company, at Steelton, Pa., and all business originating in the adjacent territory, will be handled by Chas. W. Reineohl, Sales Agent.

Iron and Steel.

The Scullin-Gallagher Iron & Steel Co., of St. Louis, Mo., has increased its capital stock from \$400,000 to \$750,000.

The first steel cast at the works of the Dominion Iron & Steel Co., at Sydney, Cape Breton, was made on the night of Dec. 30.

A despatch from London, of Jan. 2, says that an order for 60,000 tons of rails for Mexican railroads has been placed with British makers.

The Dominion Bridge Co. has recently voted to increase its capital stock from \$500,000 to \$1,000,000, which will be used in increasing its facilities.

Arthur F. Luke, formerly Treasurer of the U. S. Steel Corporation, has resigned and is succeeded by Richard Tremble, heretofore Secretary.

C. H. Foote, First Vice-President of the Illinois Steel Co., has resigned and is succeeded by T. W. Robinson, formerly General Manager. F. H. Foote, formerly Superintendent of the blast furnaces, has been elected Second Vice-President.

The United States Steel Corporation has arranged to mine its own coal in the Pittsburgh District, and work will be started at once by a subsidiary company, the National Mining Co., of which President Thomas Lynch, of the H. C. Frick Coke Co., is the head.

John G. Sadler, vice-president and manager of the Springfield Foundry Co., Springfield, O., and manager of the Indianapolis Switch & Frog Co., was shot and instantly killed, on Jan. 6, by a former employee. Mr. Sadler was 45 years old and was president of the American Foundrymen's Association.

According to a despatch from Duluth, Minn., shipments of Mesaba ore during the year 1901 were 8,991,278 tons, an increase of 44 per cent. over the previous year. An advance from 25 to 50 cents in the Mesaba ores for next

year has been agreed upon by the United States Steel Corporation and some of the independent ore producers.

The metal shipments from the southern field during the year 1901 were greater in all departments than during the previous year, with the exception of export metal. The total pig iron shipments for Alabama and Tennessee for the year were 1,554,932 tons, an increase of 226,992; cast iron shipments were 162,343 tons, an increase of 73,393.

The Breaker Island plant of the Troy Steel Company, Troy, N. Y., will soon be sold. Wm. Kemp, Vice-President of the company, is reported as saying that this will be at auction Feb. 6, at the court house in Albany. The sale is ordered in the action brought by the Guaranty Trust Co., of New York, trustee for the bondholders.

The Allis furnace in the Shenango Valley, Pa., owned by the Pick & Mather Co., of Cleveland, Ohio, has been sold to the Youngstown Iron, Sheet and Tube Co., and the Spearman furnace, owned by the Spearman Iron Co., has been sold to the Oliver-Snyder Co., of Pittsburgh. The Allis plant was sold for \$250,000 and the Spearman for \$350,000.

The Baltimore Dry Dock Co. has laid the keel and set up frames for a new day passenger steamer for the Queen Anne's Equipment Co. The vessel will have a speed of 16 knots, a steel hull and triple expansion engines and will accommodate 1,000 passengers. It will be 200 ft. long, 31 ft. wide and 12 ft. 9 in. depth of hold. It will ply between Cape May and Lewes, Del.

The American Bridge Company has bought the Detroit Bridge & Iron Company, of Detroit, Mich., which will hereafter be known as the Detroit plant of the American Bridge Company. Mr. Max J. L. Fowler has been appointed Manager. The plant thus becomes a part of the Western Division of the American Bridge Company, under the jurisdiction of Mr. August Ziesing, Western Manager, in Chicago.

Among the many Pennsylvania corporations to increase their capital stock in December and file notice in the State Department were the following: Pittsburgh Seamless Tube Company, Pittsburgh, \$1,000 to \$500,000; American Railway Tie & Girder Company, Pittsburgh, \$1,000 to \$25,000; Hockensmith Wheel & Mine Car Company, Irvin, \$1,000 to \$75,000; Eagle Foundry & Machine Company, Allegheny, \$10,000 to \$50,000; Shenango Furnace Company, Allegheny County, \$120,000 to \$600,000.

The Rail Committee.

We are glad to be able to announce the result of the letter ballot in the American Society of Civil Engineers on the question of appointing a committee to consider the question of a possible modification of the standard rail section. The vote was canvassed by the Board of Directors on Tuesday night of this week, and it was found that more than 1,000 members had voted for the committee and 60 against it. It follows then that this committee will be appointed and we shall be much surprised if some useful and interesting results do not follow.

Simplon Tunnel.

Italian newspapers report that work has been resumed on the southern end of the Simplon Tunnel. The jet of water continues, but a masonry dam has been built to a height above its level, and into the reservoir so formed the water is discharged, and flows from one side of it into a conduit. This reservoir is bridged, and the excavation is prosecuted in front of it. Now the rock is softer, and it is hoped to make up for lost time.

Later, it is reported that the volume of water discharged has greatly decreased, though it still is sufficient to make removal of the debris difficult.

Philadelphia Filtration Plant Contracts.

The Department of Public Works of Philadelphia has recently let a contract to Daniel J. McNichol to build the Torresdale filter plant. His bids are \$3,734,000 for the filtration plant, and \$1,146,000 for a filter water basin near the filter beds. Ryan & Kelly, the other bidders for the work, ask \$108,565 more than Mr. McNichol, and want a longer time to finish the work.

R. A. Malone & Co. have been awarded a contract for the reservoir at Oak Lane. The bid was \$530,000, and the work will be done in 15 months.

The Grain Elevators in Montreal Harbor.

Two years ago the Harbor Commissioners of Montreal let a contract to W. J. Conners, of Buffalo, N. Y., to build grain elevators at Wind Mill Point in Montreal Harbor. After work had been begun by Mr. Conners the Commissioners gave up the idea of finishing the work and have now returned to the contractor a sum equal to the amount he has spent, plus the interest.

To Widen Chicago River.

It is said that the Board of Sanitary Trustees has decided to widen the Chicago River to a 200 ft. channel between Lake and Van Buren streets. A strip of land varying from 15 ft. to 60 ft. will be condemned on the west bank of the river. The approximate cost of the improvement will be \$1,500,000. The Pennsylvania R. R. owns considerable of the property that will be condemned.

The Bridge Department of New York City.

Mr. Gustav Lindenthal, who was appointed by Mr. Low to be Bridge Commissioner of the City of New York, has

appointed Mr. L. L. Buck to be Chief Engineer of the Bridge Department. Thus Mr. Buck not only retains charge of the new suspension bridge (No. 2) but will also have jurisdiction over bridges Nos. 3 and 4, as well as all other bridge matters in the City. Mr. R. S. Buck, now Chief Engineer in Charge of Bridges No. 3 and No. 4, is to be Principal Assistant Engineer of the Department. Mr. O. F. Nichols, now Principal Assistant Engineer on Bridge No. 2, will remain there as Engineer in Charge. Nelson L. Robinson has been appointed Deputy Bridge Commissioner.

Floating Dry Dock at Seattle.

Moran Bros. Co., of Seattle, Wash., has recently finished a floating dry dock which is said to be the largest in the Northwest. The dock is 200 ft. long and 80 ft. wide, and the sides are 30 ft. above the pontoon, which is 12 ft. deep. The displacement is about 2,000 tons. In its construction 1,500,000 ft. of lumber and 150 tons of iron were used. Its cost was \$150,000. It has 18 compartments, 12 in the main pontoon and six in the sides. Six centrifugal pumps are operated by electric motors.

\$400,000 Dam Destroyed.

A sudden rise in the Seneca River in South Carolina last week carried away the dam of the Anderson Water, Light & Power Co., at Portman Shoals, S. C., 10 miles west of Anderson, on the night of Dec. 30. The dam was built by G. O. Tenny, of Spartanburg and cost \$400,000. It was 700 ft. long, 44 ft. high and 30 ft. wide at the base. The flood also carried away a new \$5,000 steel bridge across the river.

Chicago Pneumatic Tool Co.

The organization of the Chicago Pneumatic Tool Co., of New Jersey, has been completed, and on Dec. 31, 1901, took over the properties proposed, namely, the business and plants of the Chicago Pneumatic Tool Co., the Boyer Machine Co., of Detroit, Mich., the Chisholm & Moore Manufacturing Co., of Cleveland, Ohio; the Franklin Air Compressor Co., of Franklin, Pa., and the new Taite-Howard Pneumatic Tool Co., Ltd., of London, England. The securities issued are \$2,000,000 5 per cent. 20-year gold bonds, and \$5,000,000 of common stock, there being only one kind of stock. There remains in the treasury, unissued, \$500,000 of bonds, and \$2,500,000 of stock. The Company starts with over a million working capital, of which more than 50 per cent. is cash. It also starts with actual earnings by the constituent companies, before this organization, at the rate of \$700,000 a year, which, after paying fixed charges and sinking fund under the mortgage, leaves 11 per cent. earnings on the stock. The Directors of the company are: Charles M. Schwab, President United States Steel Corporation; John A. Lynch, President National Bank of Republic, Chicago; John R. McGinley, capitalist and banker, Pittsburgh; James H. Eccles, President Commercial National Bank, Chicago; William B. Dickson, Assistant to President, United States Steel Corporation; Charles A. Miller, President Galena Oil Co.; J. W. Duntley, President Chicago Pneumatic Tool Co.; Joseph Boyer, President Boyer Machine Co., Detroit, Mich.; Edward Y. Moore, Vice-President Chisholm & Moore Manufacturing Co.; Max Pam, Counsel; John Charles Taite, of Taite-Howard Co., London, Eng., and Charles Parker Whitcombe, of Taite-Howard Co., London, Eng. The Executive Committee is as follows: J. W. Duntley, Chairman; Charles M. Schwab and Max Pam. The officers are: J. W. Duntley, President; W. O. Duntley, Vice-President; Edward Y. Moore, Second Vice-President; Ernest P. Wenger, Treasurer; H. R. Kent, Assistant Treasurer; Le Roy Beardsley, Secretary; S. G. Allen, Assistant Secretary; Joseph Boyer, Mechanical Engineer; A. J. Doughty, General Superintendent, and Pam, Calhoun & Glennon, General Counsel. The Executive Board has made the following appointments: W. O. Duntley, Vice-President and General Manager; C. E. Walker, Assistant General Manager; Thomas Aldcorn, General Sales Agent; W. P. Pressinger, General Manager Air Compressor Department; Charles Booth, Manager Chicago office; S. G. Allen, Manager New York office.

Splicing Passenger Car Sills.

The committee of the Master Car Builders' Association sends the following circular:

The Committee on Splicing Passenger Car Sills requests replies to the following questions:

1. Do you consider a sill as strong with a splice in it as one without?
2. At what point in each sill do you consider it best to make the splice?
3. Would it, in your opinion, be safe to make the splice directly over the body bolster?
4. Do you consider it good policy to make the splice over the tie timbers?
5. In your opinion, would it be better to use an iron plate on the side of the splice of $\frac{1}{2}$ in. or $\frac{3}{4}$ in. in thickness, the depth of the sill and of sufficient length to strengthen the sill, instead of wood?
6. Would you advise the use of a key in making the splice?
7. What do you consider the length of the splice should be?
8. What do you consider the best form of splice?
9. What number and size of bolts, in your opinion, should be used in making the splice?

The committee will be glad to have you furnish prints showing your practice or preference of splicing sills.

Replies are to be sent to John S. Lentz, Master Car Builder, L. V. R. R., Packerton, Pa., not later than March 15, 1902.

New Car Ferry.

The Crosby Transportation Company, Milwaukee, Wis., which has been running a line of boats all the year round on Lake Michigan, from Grand Haven to Mus-

kegon and Milwaukee, will build a car ferry. The contract has not been let, but it is practically decided that the boat will be about 300 ft. long and will be built at Grand Haven.

American Locomotive Co. Improvements.

The American Locomotive Company announces that it will spend at least \$2,000,000 in improving its plants. The capacity of the plant at Schenectady will be increased to 1,000. Present orders will keep the plants busy until well on in the year, the total number of orders at present unfilled being 1,750.

Consolidation of Rosendale Cement Companies.

The Consolidated Rosendale Cement Co., of Binnewater, Ulster county, N. Y., was incorporated Jan. 6, with a capital of \$1,500,000, of which \$1,000,000 is to be of 7 per cent. non-cumulative preferred and \$500,000 common stock. The directors are James P. Paulding, A. L. Norrie, Wm. C. Beach, A. C. Hull, A. J. Rose, W. C. Lyman, P. M. Brett and Robert Lawrence, of New York City, and J. B. Cook, of Binnewater. This consolidation includes only Rosendale cement quarries and mills. Some of the companies included are the New York & Rosendale Cement Co., F. O. Norton Cement Co., the Lawrence Cement Co., Lawrenceville Cement Co., Andrew J. Snyder Cement Co., the cement property of Thomas Miller & Sons, at Wayland, N. Y., and the Newark Lime & Cement Mfg. Co., at Rosendale.

New Plant for the American Bridge Co.

The American Bridge Co. will build an addition to its Pittsburgh plant at a cost of several hundred thousand dollars. James A. Huston, General Manager of the company, says that the contracts made with the Wabash Railroad are such that it is impossible for the bridge company to make the necessary supplies in its own plants or to get them elsewhere. As the bridge work of the company is rapidly developing larger structures, the company decided to build a permanent plant which will give it facilities to take care of all future contracts. The directors of the company will decide some time this month the exact location of the new plant.

Signaling Notes.

The *Atlanta Journal* reports that a law is to be passed, or will soon be passed, by the Georgia Legislature, providing for the establishment of interlocking signals at grade crossings of one railroad with another, and authorizing trains to pass properly signaled crossings without stopping; and that the Central of Georgia and other roads are preparing to put in such signals at a number of crossings.

The Oregon Short Line now has automatic block signals (Hall disks) on its line between Pocatello and McCammon, 23 miles. The block sections are about two miles long. The line is single track and signals are provided for movements in both directions.

The New York Central is to erect an interlocking plant near Churchville. The machine will have 40 levers.

The Chicago & Alton has ordered Hall automatic signals for its line from Zarley's to Mazonia, 31 miles; and a number of sections, not continuous, between Mazonia to Godfrey, 35 miles, single track; and from Sherman to Springfield Junction, 13 miles, double track. These signals are to be arranged to stand normally in the stop position.

Interlocking signals have been put in at the junction of the Chicago & Northwestern and the Peoria & Pekin Union near Peoria, Ill.

Six Months' Shipbuilding.

During the six months ended Dec. 31, 1901, there were built in the United States and officially numbered by the Bureau of Navigation, at Washington, 717 rigged vessels of 154,073 gross tons, compared with 568 rigged vessels of 179,229 gross tons for the corresponding six months of 1900. Canal boats and unrigged barges are not included. The principal decline, 19,752 tons, is on the Atlantic seaboard, and is attributable to work on several large ocean steamers, which will be completed during the coming six months. Included in the six months' figures are 38 vessels, aggregating 103,832 tons. Of these 14 steel steamers aggregating 52,310 tons were built on the great lakes. Four are for the seaboard—one, the "Minnetonka," will be cut in two to pass the canals. On the seaboard 15 wooden schooners were built, five steel steamers for the coasting trade, and one steel ferryboat. Square rigged vessels are the steel ship "William P. Frye," 3,374 tons, and two barkentines on the Pacific, aggregating 2,310 tons.

American Car and Foundry.

The earnings for seven months ending Nov. 30, 1901, compare as follows:

	1901.	1900.
Balance April 30.....	\$5,074,950	\$3,698,648
Net seven months.....	2,025,475	2,547,226
Surplus and earnings.....	\$7,100,425	\$6,245,874
Preferred dividends.....	1,575,000	1,539,075
Balance after preferred dividends..	\$5,525,425	\$4,686,799
Common dividends.....	450,000	445,000
Balance Nov. 30.....	\$5,075,425	\$4,241,799

The company is receiving material now without delay. During the last few months some of its plants have been hampered because material could not be promptly obtained and earnings have suffered to some extent. The company has made extensive improvements at several of its plants. The capacity of one of its passenger car shops has been doubled.

THE SCRAP HEAP.

Notes.

The Great Northern has increased the pay of engine-men and firemen about 10 per cent.

The Buffalo *Times* says that the Wabash road is to have ticket collectors, independent of conductors, on its passenger trains.

The steamer *Walla Walla*, of the Pacific Coast Steamship Company, was sunk by a collision off the coast of Oregon, on Jan. 3, and 42 persons were drowned.

On Dec. 26, near Colton, Cal., a sandstorm covered the main track of the Southern Pacific for six miles, so as to make it impassable. The wind was so high that the track repairers had to stop work, and the road was blocked for many hours.

The newspapers in the Northwest say that the Northern Pacific no longer has news agents on its passenger trains. One account says that the company will itself maintain newsstands at the principal stations and that newspapers will be for sale on the dining cars.

An express train of the Baltimore & Ohio was stopped by robbers on the night of Jan. 5 near Swanton, Md., a switch being misplaced so as to turn the train into a side track, but the express messengers and guards promptly fired on the robbers and they ran off.

Chicago despatches say that the Chicago & Northwestern has modified the regulations of its pension department so that employees who have served the company for 20 years will be eligible; hitherto pensions were allowed only to men who retired after 30 years' service.

Press despatches from Cleveland say that the American Steel & Wire Company is to pay pensions to its old employees. A fund is to be at once set apart, and over 25,000 employees will be eligible to receive its benefits. The employees will not be asked to contribute anything to the fund.

On the morning of Dec. 30 a passenger train of the Yazoo & Mississippi Valley was boarded by four men near Leland, Miss., who murdered a passenger and then, at the point of a pistol, compelled the engine-man to cut his engine loose from the train and carry them to Cleveland, Miss. It is said that the shooting was the result of a quarrel. Two of the four men are said to be prominent citizens. All were soon captured.

At Boston, Jan. 6, the Federal Grand Jury returned an indictment against the New York, New Haven & Hartford Railroad for threatening to dismiss an employee because of his membership in a labor organization. This appears to be a further development of the case at Taunton, a year or two ago, where a telegraph operator claimed to have been unjustly discharged. The Railway Telegraphers' Brotherhood has kept up the fight against the railroad.

The Court of Appeals of the State of New York has decided that the New York & Harlem Railroad, owner of the elevated four-track railroad through Park avenue, New York city, is not liable to owners of dwellings and other buildings fronting on that avenue for damages due to the shutting off of light and air and the noise made by passing trains. The viaduct in question was built under a special act of the Legislature and a part of the expense was borne by the city. In the lower court one of the abutters had obtained a judgment against the railroad. The prevailing opinion says that the State is the party which should recompense the property owners for their injuries, but at the same time the belief is expressed that the viaduct as a whole is an improvement and a benefit to the city, and that there is, therefore, some question whether the State should pay anything.

Traffic Notes.

It is said that a coal dealer in Berlin, Germany, has ordered 40,000 tons of anthracite coal from this country.

The New York Central is having made at Noank, Conn., six car floats for use in New York Harbor, which will be 330 feet long, considerably longer than any vessels now in use in that harbor.

A company has been organized at Pittsburgh to run freight car transfer boats, carrying 12 cars each, on the waters in and near that city, to connect with the new railroad to be built to Pittsburgh by the Wabash Railroad Company.

The number of freight cars moved over the Middle Division of the Pennsylvania Railroad in the 12 months to January 1 was 1,809,795; and this is said to be 100,000 cars less than during the preceding year, though the tonnage carried was larger than in 1900.

The Michigan Central, in reducing focal fares on its main line in Michigan to two cents a mile, has withdrawn the round trip tickets heretofore sold; and this affects the branches as well as the main line so that in some cases the price of a round trip ticket has been slightly increased.

The statistics of the Chicago Board of Trade show that shipments of flour eastward from that city, in the year 1901, increased about 17 per cent. over the movement of the preceding year; and about 59 per cent. over 1890. The grain shipments were, of course, considerably smaller in 1901 than in the preceding years, owing to the smaller crop.

The United States Supreme Court has decided that the long-and-short-haul law of Kentucky is constitutional. It does not fix rates but merely provides for uniformity of rates under certain conditions. The decision is in the suit against the Louisville & Nashville Railroad, which was indicated and fined \$300 for violating the law in carrying coal to Louisville cheaper than it carried from the same point to Lebanon. The verdict of the lower Kentucky State Courts was favorable to the State law and Constitution, and this finding was affirmed by the State Court of Appeals. The present opinion was de-

livered by Justice Shiras and affirms the opinion of the Kentucky Court. The company based its contest on the allegation that the long and short haul provision of the State Constitution and law is in violation of the Fourteenth Amendment of the Constitution of the United States.

High Speed Traffic in City Streets.

The collision on Market street yesterday morning between a trolley car and a fire engine is only an aggravated illustration of the danger constantly run on the crowded streets whenever a fire occurs. In this case the fault seems to lie with the motorman of the car, who apparently became confused and stopped his car exactly where a collision was inevitable. But in most cases it is the skill and coolness of the motorman and drivers of wagons and carriages that prevent collisions with fire engines. The reckless way in which fire engines and ladder trucks are driven through the streets is an outrage. There is no reason and no law authorizing such foolhardy haste. It is the duty of a fire company to get to a fire as quickly as possible, but in performing that duty it has no right to put the lives and limbs of hundreds of people in danger. The fact that a man happens to be the driver of a fire engine does not give him the privilege to kill as many people as he chooses.—*Philadelphia Press*.

The Lady Engineer Again.

A press note says: "Miss Alverda M. Stout, of Columbus, Ohio, although but 18 years of age, is a mechanical engineer and among the most competent members of that craft." Should the young woman's duties at some time require her to cull a few indicator cards from a locomotive going at a 75-mile clip there might be some difficulty in keeping the hat on straight. But let us hope that Nature would be so startled that it could be said "and all the air a solemn stillness held."

A German Railroad in China.

The railroad which the Germans are building in the Province of Shantung, in China, is now in operation for 80 miles. It passes through Kaumi, where, two years ago, the people rose and fought to prevent the building of the railroad. Recently a band of peasants, 80 in number, took a train at a local station to visit Kaumi, and explained their purpose as follows: The prefect of the district had spread abroad the statement that when the road was built and trains were running for five li (1½ miles) on each side of the track the grain and grass would wither, nothing more would grow, and the houses would be burned down. Now they wished to pass over the line and test the truth of the prefect's prediction. When they returned they said they were convinced that he had lied, for crops along the line seemed to be growing as well as ever.

Damascus-Mecca Railroad.

The prospects and progress of the Damascus-Mecca Railroad, a road for pilgrims, which was to be built with the proceeds of the offerings to the faithful, and at first entirely by their hands, are reported differently by the Turks and by the infidels—the latter possibly snarling because they have missed fat contracts. Officially, at a recent meeting of the Railroad Science Society in Berlin, requests were made for a number of engineers capable of directing the work; and much has been said of the great amount of the subscriptions of the materials purchased, and of the work actually under way. Europeans in Turkey, however, say that scarcely a twentieth of the capital necessary has been subscribed as yet, and not all the subscriptions paid in. The Turkish engineer officers and troops who were to do the technical work are very unsatisfactory; the Bedouins, who range over a large part of the long route (some 1,600 miles) are in arms against it, and have actually captured a mountain howitzer belonging to an engineers' escort; and the authorities have been compelled to let contracts to Christians, and it is said that the Sultan even contemplates turning over the whole enterprise to a French company. As collections have been sought for this line throughout the whole Mohammedan world, the failure to complete it would be a severe blow to the authority of the Sultan.

Freight Car Capacity in Russia.

The capacity of freight cars in Russia, until 1880, was 610 poods = 22,029 lbs., or almost exactly 10 metric tons. It was then decided to increase their capacity to 750 poods = 27,066 lbs. This was done generally with very little change, except in the springs. There was considerable opposition, based on the established custom of buying and selling grain in carloads of 610 poods; but it was found that the Russian peasants even quickly adapted themselves to the larger cars. It is now proposed to make a further increase of one-fifth in the standard car capacity, to 900 poods = 32,500 lbs., which will make them nearly the same as the present German standard of 15 metric tons.

Freight Handling in New York.

The great railroad corporations entering New York are spending millions and millions for improvements in passenger traffic. This is both urgent and praiseworthy, but what, may we ask, are these railroads doing for the prompter and more economical handling of freight? New York handles nearly 50 per cent. of the foreign commerce of the country. In addition it is the center of distribution for enormous amounts of domestic manufactures; also the point of the great traffic generated by a population of over 4,000,000 people. The cost of handling freight in New York could be greatly reduced by the introduction of more economical and scientific methods than the happy-go-lucky system now in vogue. The extra cost of superfluous handling and avoidable delays is a serious tax upon the commerce of this city, which in days of small profits may easily prove a factor in driving business that should naturally come here to other localities. In many respects New York is admirably equipped for freight handling: the free interchange and classification of freight being promoted rather than hindered by our magnificent water front, which, dotted with well-equipped terminals of various lines, constitutes an almost ideal clearing house for freight. Up to this point the railroads seem to have done well, and there is little occasion for complaint; but has all been done that should be done to facilitate and cheapen the local cost of freight handling? What are the objections to the railroads extending their facilities to the collection, delivery and storage of merchandise at terminal points? Why should not a properly-regulated trucking system operated by the railroads avoid much of the delay and confusion which now exist, lessen the number of trucks in the streets, and so diminish congestion? Why should not the railroads devise a suitable warehouse system whereby the manufactured products of New England and other sections might be stored in the outskirts direct from the cars and reshipped when ordered to interior destinations

without ever entering the city; thus freeing the streets of much traffic which now simply adds to the congestion? There is a vast amount of unnecessary handling of freight in New York, and the city is sorely in need of more economical methods.—*Journal of Commerce*.

Long Bridge Over the Potomac River.

Messrs. McDermott & Co., of Jersey City, N. J., to whom the contract for the huge piers and abutments for the new Long Bridge across the Potomac River for the six railroad companies to enter the city of Washington, have begun preparatory work on the Virginia end. A representative of the contracting company says that they will soon begin driving the piles, of which there are to be 1,700 in the foundations.

World's Shipbuilding for 1900.

Consul Monaghan writes from Chemnitz, Nov. 27, 1901: The total number of vessels of over 100 registered tons built during 1900 is given in German returns as 319 sailing vessels and 966 steamships, with a total tonnage of 2,268,938 tons. The following table gives the relative position of the shipbuilding countries for 1900:

	Ships.	Registered tons.
England (inclusive of colonies).....	698	1,471,475
America	197	297,931
Germany	90	211,850
France	65	101,318
Italy	37	54,382

Congressional Committees.

The full committees of the United States Senate and House of Representatives have now been announced, and the membership of a few of them is given below:

Interstate Commerce. *Senate*: Elkins (chairman), Cullom, Aldrich, Keen, Dooliver, Foraker, Clapp, Millard, Tillman, McLaurin of Mississippi, Carmack, Foster of Louisiana, and Patterson. *House*: Hepburn, Fletcher, Sherman, Wanger, Joy, Corliss, Stewart, Mann, Lovering, Coombs, Tompkins, Davey, Adamson, Davis, Shackelford, Ryan and Richardson.

Pacific Railroads. *Senate*: Dooliver (chairman), Frye, Foraker, Stewart, Millard, Morgan, Harris, Rawlins and Tallafiero. *House*: Smith (Mich.), Hepburn, Shattuc, Foss, Driscoll, Palmer, Jackson, Storm, Landis, Marshall, Slayden, Sheppard, Finley, Creamer and Feely.

Railroads. *Senate*: Clark, Wyoming (chairman), Nelson, Lodge, Hawley, Wetmore, Scott, Bard, Bacon, Pettus, Money and Carmack. *House*: Davidson, Shattuc, Shawalter, Roberts, Skiles, Deemer, Knapp, Irwin, De Graffenreid, Burnett, Cassingham, Lever and Mahoney.

Improvement of the Mississippi River. *Senate*: Nelson (chairman), Dooliver, Millard, McLaurin of South Carolina, Bate, McNery, and McLaurin of Mississippi. *House*: Bartholdt, Morris, Joy, Prince, Hedge, Rumpke, Bowersock, Fletcher, Bousard, Howard, Henry, Mickey and White.

Interoceanic Canals. *Senate*: Morgan (chairman), Hawley, Platt of New York, Hanna, Pritchard, Mitchell, Millard, Kittredge, Harris, Turner, Foster of Louisiana.

Rivers and Harbors. *House*: Burton, Reeves, Dovenor, Bishop, Acheson, Morris, Alexander, Tongue, Lawrence, Davidson, McLachlan, Lester, Bankhead, McCulloch, Sparkman, Ball and Hansdell.

Transportation Routes to the Seaboard. *Senate*: Dillingham (chairman), Clark of Wyoming, Perkins, Gamble, McLaurin of South Carolina, Turner, Pettus, Daniel and Dubois.

Technical Schools.

Purdue University.—About Feb. 1, a new course in telephony will be added to the school of electrical engineering and the instruction in the course of telephonic engineering will form a branch of the regular instruction in electrical engineering. It is found that students completing the usual electrical courses must now put in about two years additional acquiring a knowledge of special details of telephone practice. The new course is expected to take the place of a portion of this apprenticeship. The special work will come in the senior year and consist of advanced instruction in telephony and lectures, and work in a laboratory equipped with complete working parts of different telephone systems.

A Deserved Advancement.

At the December meeting of the St. Louis Railway Club Mr. Berkley told this story:

"Mr. Flory commenced railroad as a brakeman on a freight train, and one day the conductor told him to go back with the engine on the switch and get car No. 100. Mr. Flory went back, and after being gone about 15 minutes he came back without the car. The conductor says to him, 'Why didn't you get the car?' 'Why, I couldn't,' says he, 'there was another one in front of it.' Finally he developed into a railroad commissioner."

For Coaling Ships.

The Navy Department has approved a new method of coaling battleships and armored and protected cruisers, which has been recommended by the Naval Board on Construction. The new system which provides for the use of booms and the delivery of the coal directly into the bunkers through the large hatches, will be simple to operate and will save time.

The Carnegie Institution.

At Washington, D. C., on Jan. 4, a corporation to be known as the Carnegie Institution was formed to establish and maintain in the City of Washington an institution for promoting original research in science, literature and art. The incorporators are: John Hay, Secretary of State; Edwin D. White, Justice of the United States Supreme Court; D. C. Gilman, ex-President of Johns Hopkins University; Charles D. Walcott, Superintendent of the United States Geological Survey; Dr. J. S. Billings and Carroll D. Wright, Commissioner of Labor.

"Knocking Down" in Switzerland.

The Swiss Northeastern Railroad detected a combination of railroad conductors for the re-sale of tickets which they had taken up. Twenty of these have been tried by a criminal court in Zurich. Five of the 20 were acquitted and 15 sentenced to imprisonment for terms varying from two weeks to five months, and they were fined into the bargain.

LOCOMOTIVE BUILDING.

The *St. Louis Valley* is having five locomotives built at the Baldwin Works.

The *Florida East Coast* is having five locomotives built at the Baldwin Works.

The *New York, Chicago & St. Louis* is having five locomotives built at the Manchester Works.

The *Quebec Southern* has purchased seven coaches from F. M. Hicks, of Chicago, for February delivery.

The *Cincinnati Southern* has ordered 20 engines from the Baldwin Works and four from the American Locomotive Co.

The *Atlas Portland Cement Co.* is having two locomotives built at the Manchester Works of the American Locomotive Co.

The *Indiana, Illinois & Iowa* is having six locomotives built at the Baldwin Works, instead of four, as reported Nov. 22.

The *Lake Shore & Michigan Southern* has 30 locomotives building at the Brooks Works, including the order reported in our issue of Nov. 22.

The *Hocking Valley* has ordered 27 locomotives from the Rodger Locomotive Works, in addition to order placed with the Baldwin Locomotive Works.

The *Lake Superior & Ishpeming* has ordered three 4-wheel switch engines from F. M. Hicks. The engines will weigh 38 tons and have sloping tanks. They are for February delivery.

The *Vera Cruz & Pacific* has purchased of F. M. Hicks, of the Hicks Locomotive & Car Works, Chicago, two 10-wheel engines for January delivery. They will have 18 x 24-in. cylinders and are for freight service.

The *Central of Georgia* has ordered five freight locomotives, weight 196,000 lbs., with 21 x 32-in. cylinders, from the American Locomotive Co., and six passenger locomotives to be built at the Rodgers works. The latter will have 19 x 26-in. cylinders. The freight locomotives are of the same pattern as those built last spring by the Cooke Works.

The *Missouri, Kansas & Texas*, as noted Dec. 27, has ordered 10 mogul, three consolidation and 10 10-wheel passenger engines from the Baldwin Works for August and September delivery, and 10 mogul locomotives from the American Locomotive Co. Two of the consolidation engines will weigh 166,000 lbs. each, with 149,000 lbs. on the drivers, which will be 56 in. in diam.; cylinders 22 x 28 in.; straight top boilers with 200 lbs. working steam pressure; 321 tubes 2 in. in diam., and 14 ft. 10 in. long; fire-box 112 in. long and 66 in. wide; tender capacity, 6,000 gals. of water and 12 tons of coal. One of the consolidations with wide fire-box will weigh 167,000 lbs., with 152,000 lbs. on the drivers; cylinders 22 x 28 in.; 56-in. driving wheel; straight top boiler with 200 lbs. working pressure; 290 tubes 2 in. in diam. and 15 ft. long; fire-box 114 in. long, 96 in. wide; tender capacity, 6,000 gals. of water and 14 tons of coal. The mogul engines will weigh 140,000 lbs., with 120,000 lbs. on the drivers, and will have 20 x 28-in. cylinders and 63-in. drivers; wagon top boilers with working steam pressure of 200 lbs.; 321 tubes 2 in. in diam., 12 ft. 8 in. long; fire-boxes 102 in. long, 66 in. wide; tender capacity of 6,000 gals. of water and 12 tons of coal. The 10 passenger engines will weigh 143,000 lbs., with 108,000 lbs. on the drivers, and have 20 x 22-in. cylinders; 72-in. drivers; wagon top boilers with a working steam pressure of 200 lbs.; 290 tubes 2 in. in diam., 14 ft. 6½ in. long; fire-boxes, 108 in. long, 41¼ in. wide; tender capacity of 6,000 gals. of water and 10 tons of coal. The specifications for the entire number include Westinghouse air-brakes, National hollow brake-beams, Janney couplers, Monitor injectors, U. S. metallic packings, Coale safety valves, Leach sanding devices, Nathan sight-feed lubricators and Ashcroft steam gages and Diamond S brake-beams.

CAR BUILDING.

J. G. Brill & Co. have ordered 14 freight cars from the Terre Haute Works.

The *Chicago Great Western* rumor printed in our issue of Jan. 3 was incorrect.

The *National Rolling Stock Co.* has ordered 50 freight cars from the St. Louis Works.

The *International & Great Northern* is having 50 freight cars built at St. Louis.

The *St. Louis Valley* has ordered 250 coal cars from the American Car & Foundry Co.

The *Cincinnati, Hamilton & Dayton* is having four coaches built by Barney & Smith.

The *Mobile & Ohio* has ordered two dining cars from the American Car & Foundry Co.

The *Cumberland & Pennsylvania* has ordered three coaches from Harlan & Hollingsworth.

The *Norfolk & Western* has ordered 1,000 gondolas from the American Car & Foundry Co.

The *Illinois Central* has ordered 500 ventilated fruit cars from the American Car & Foundry Co.

The *Tennessee Copper Co.* has ordered eight ballast cars from the American Car & Foundry Co.

The *Leligh Portland Cement Co.* has ordered 15 steel ore cars from the American Car & Foundry Co.

The *Vera Cruz & Pacific* has ordered four coaches and 20 box cars from the American Car & Foundry Co.

The *Rock Island & Peoria* has ordered 25 dump cars and 10 ballast cars from the American Car & Foundry Co.

The *Philadelphia & Reading* has ordered five open-end and five vestibule baggage cars from the American Car & Foundry Co.

Individual parties have ordered 50 mine cars, 200 box cars, 52 tank cars and six motor street car bodies from the American Car & Foundry Co.

The *Union Coal Tar & Chemical Co., F. M. Pease and Barrett Mfg. Co.*, car orders, reported Jan. 3, were all placed with the Illinois Car & Equipment Co.

The *Choctaw, Oklahoma & Gulf* has ordered from the Mt. Vernon Car Mfg. Co. 1,200 box cars and 300 stock cars, of 60,000 lbs. capacity, and 100 flat cars, of 80,000 lbs. capacity. Also 250 coal cars of 80,000 lbs. capacity, from the American Car & Foundry Co. The latter order may be increased.

The *Wabash*, as noted in our issue of Dec. 27, has ordered 1,500 wooden gondola cars for the Wheeling & Lake Erie, to be built by the American Car & Foundry Co. These cars will have a capacity of 80,000 lbs., weight 33,500 lbs., and be 36 ft. long, 8 ft. 6½ in. wide, with sides 4 ft. ¾ in. high. The special equipment includes cast-steel bolsters, one-half to be furnished by the American Car & Foundry Co., and half by the Shackle, Harrison & Howard Iron Co.; Westinghouse air-brakes, Universal bearings and wedges, Gould couplers, Thornburgh tandem draft rigging and Chas. Scott springs.

BRIDGE BUILDING.

BAYONNE, N. J.—The Central R. R. of New Jersey will build a new bridge at East Thirty-second street. It has an ordinance before the Councils.

BAY CITY, TEXAS.—Jesse Matthews, County Judge, tells us bids are wanted until Jan. 21, with plans and specifications, for a steel and wood bridge between 2,500 ft. and 3,000 ft. long, over Colorado River, 1½ miles from the railroad station. The County Commissioners want a steel fixed span 300 or 350 ft. long and the balance of the bridge to be wooden trestle. The bridge will be 18 ft. wide and bidders must furnish certified check for \$5,000 with their bid.

BELLEFONTAINE, OHIO.—The matter of the High street railroad bridge, we are told, has been referred to the City Engineer for estimate of cost. The survey has not been made.

BURLINGTON, ONT.—The Grand Trunk Ry., it is said, will build a new bridge over the canal here. It will be of steel and cost about \$35,000.

BUTTE, MONT.—Two more steel bridges are to be built on the Portage cut-off of the Montana Central. One is over Park Drive in Butte. This is to be a single 24-ft. span on stone abutments. The other will be at Black Eagle Falls and will be of two spans, each 40 ft., on stone abutments.

CARTHAGE, ILL.—The Supervisors of Hancock County have authorized a steel bridge over Golden Creek at Sonora; also a steel bridge over Bear Creek, in the town of Walker. James W. Westfall, County Clerk.

CARTHAGE, MO.—The County Court is reported to have authorized three bridges at a cost of \$13,680.

CHANGewater, N. J.—Regarding the report that the Lackawanna R. R. will build a new bridge at this place, we are told that the company has no plans at present for a new bridge at Changewater.

CINCINNATI, OHIO.—Bids were received as follows, by the Board of Public Service, on Dec. 30, for the St. Clair street bridge: Elkhart Bridge Co., Elkhart, Ind., \$7,795, which is nearly \$4,000 lower than the next highest bid, that of the Brackett Bridge Co. The other bidders were: Pitts Bridge Co., Massillon Bridge Co., King Bridge Co., and the Hudson & Cleveland Co.

The bids opened for the canal bridge at Marshall street were: Brackett Bridge Co., \$4,900; King Bridge Co., \$4,925; American Bridge Co., \$4,875; Massillon Bridge Co., \$5,000.

COLORADO SPRINGS, COLO.—The Denver & Rio Grande will build a trestle of three 29-ft. spans across South Tejon street. Estimated cost, \$35,000.

COUNCIL BLUFFS, IOWA.—S. L. Etnyre, City Engineer, writes us that plans have been accepted for the steel bridge over Indian Creek at Mynter and Main streets. Bids will be wanted in about a week.

DANVILLE, VA.—Bids are wanted at once by the Danville & Western Ry. for a three-span through bridge, 133 ft. each span, over Dan River, seven miles from Danville. J. A. White, Superintendent.

DENISON, TEXAS.—The question of building a viaduct over the Missouri, Kansas & Texas tracks at or near Austin avenue is again before the Council.

DULUTH, MINN.—Bids are wanted by the Duluth Canal Bridge Co. for erecting the metal for the suspended bridge over the ship canal during the close of navigation beginning November, 1902.

EUFULA, IND. TER.—The Eufaula Bridge Co., of this place, has been incorporated under the laws of Indian Territory, with a capital stock of \$10,000, by F. W. Ahrens, F. N. Goldsborough and W. G. Mohart. The company will build the proposed toll bridge across the Canadian River here.

GOYAZ, BRAZIL.—It is said that bids are wanted for the steel and iron for three combination cantilever highway bridges, to be built in the State of Goyaz by Arnold, Mellor & Co., of Araguany, Minas, Brazil. Address J. J. Mellor, Reinow, Cheshire, Eng.

HAMILTON, O.—Chris. Pabst, County Auditor, tells us he will receive new bids until Feb. 4 for the superstructure of the proposed bridge over Dry Fork, near Shandon.

HOUGHTON, MICH.—The bids for the bridge over Sturgeon River, near Otter Lake, have been rejected by the Portage Township Board. Plans will be made and bids wanted within a week or so.

HUNTSVILLE, MO.—Bids are wanted, Jan. 25, by N. A. Metlock, County Surveyor, for a steel low truss bridge over Middle Fork and Sugar Creek.

JACKSONVILLE, TEXAS.—The Texas & New Orleans Ry. will build an overhead bridge at Jacksonville, where it will cross the International & Great Northern.

KNOXVILLE, TENN.—Reports from Tennessee state that the recent high waters destroyed numerous bridges, some of which are as follows: Virginia & Southwestern R. R. bridge at Elizabethton, bridge at Butler, and several trestles on the Tennessee Division of the road. The East Tennessee & Western North Carolina is said to have lost a bridge at Valley Forge and two near Elizabethton. The Southern Ry.'s viaduct at Watauga is also damaged.

LONDON, ONT.—Plans will be made at once for the bridge over Thames River at the Muncey site. It will be of steel on concrete abutments, and will have two 150 ft. spans and two of 60 ft. each.

MARSHALLTOWN, IOWA.—It is stated that the Iowa Central has engineers locating sites for new bridges to be built soon. They will be at Lime Creek, near Mason City; Timber Creek, near Marshalltown; South Skunk River, near Oskaloosa, and Sheridan River, near Centerville.

MIDDLETOWN, OHIO.—The County Commissioners have rejected the bids for the bridge over Dry Fork. The County Auditor will receive new bids.

MOOREFIELD, ONT.—A steel bridge will be built over the Conestogo River. Particulars can be had from the Town Clerk.

NEW YORK, N. Y.—One of the last acts signed by Mayor Van Wyck was the ordinance providing for a bridge over Gerritson's Basin at Avenue U, in the Thirty-first and Thirty-second wards, Brooklyn, at an estimated cost of \$16,000.

NEW BRUNSWICK, N. J.—The Pennsylvania Railroad has submitted two sets of plans by which it proposes to abolish all the grade crossings in this city. Several

streets will have to be vacated, others lowered and a new station will be erected in order to carry out the project. The cost to the city will be about \$125,000.

NORRISTOWN, PA.—The contract for the Philadelphia & Reading bridge over the Schuylkill River is said to be let to the American Bridge Co. The bridge will be 1,600 ft. long.

NORWICH, CONN.—C. E. Chandler and S. B. Palmer, engineers for the proposed steel bridge over Sketucket River, at Taftville, have made plans for a 250-ft. structure, which will be paid for by the town of Norwich.

PALESTINE, TEXAS.—Among the proposed improvements on the International & Great Northern for the year 1902 is renewing the long span of Brazos River bridge, cost \$70,000; renewing Bear Creek bridge, \$33,500; renewing Cibola River bridge, \$36,000. A \$5,000 turntable will be placed at Palestine; also a \$5,000 turntable at San Antonio.

PLATTSBURGH, N.Y.—An officer of the Chicago, Burlington & Quincy writes that the company will soon undertake the work of rebuilding the bridge over the Missouri River near Plattsburgh. The work practically amounts to renewal of the iron work in the present structure, although one additional pier will be built. None of the contracts have been let so far, with the exception of the pneumatic caisson for the new pier, which will be done by Wm. Sooy Smith & Co.

RALSTON, OKLA. T.—G. P. Moore, County Clerk, tells us he will receive bids until Jan. 18 for three bridges over Arkansas River, located at Ralston, Blackburn and Cleveland, each to be about 1,100 ft. long. The contract will be awarded on the 20th by the Commissioners.

SPRINGFIELD, MASS.—Plans have been let by City Engineer Slocum for the South End crossing improvements. The plans are with the Mayor.

STEELTON, PA.—A charter has been granted in Pennsylvania to the Steelton and New Cumberland Bridge Co. to build a bridge across the Susquehanna River at Steelton. (Dec. 19, 1901, p. 882.)

TOLEDO, OHIO.—T. F. Whittelsey, General Manager of the Toledo Ry. & Terminal Construction Co., is receiving bids for a deck plate girder draw for a bridge over Miami and Erie Canal, near Maumee City. This company will also build a bridge over Maumee River, to be about 2,900 ft. long.

WALKERTON, ONT.—Bids are wanted, Jan. 28, for a steel bridge over Mill Creek, six miles from Port Elgin. James Warren, of Walkerton, is engineer.

WINGHAM, ONT.—Bids are wanted until Jan. 20 for the superstructure of two steel bridges. One will be over Bayfield River, about 1½ miles west of Clinton, 110 ft. long. The other bridge will be over Maitland River, between Upper and Lower Wingham, about 132 ft. long. John Ansley, County Commissioner.

WINSLOW, ME.—J. W. Bassett, Town Clerk, writes that a committee consisting of C. E. Warren, I. E. Gitchell, A. Bassett, E. E. Smith and L. A. Simpson has been appointed to receive bids for the 250 ft. steel bridge (two spans) over Sebasticook River. The estimated cost is \$12,000. Mr. Bassett also writes that the recent freshet has carried off another bridge.

WOODLAND, CAL.—The counties of Yolo and Sutter will be required to build their own bridge across the Sacramento River at Knight's Landing, as the Southern Pacific Co., with whom the counties contemplated building a joint bridge, has already started work on its railroad bridge.

WOONSOCKET, R. I.—Frank M. Mills, City Engineer, tells us that the work at the Globe bridge consists of widening the street at that place, which requires tearing down of a stone arch of 40-ft. span and building a 70-ft. arch in its place. Also lengthening another arch about 15 ft. on each end and about 2,000 cu. yds. of masonry and 8,000 yds. of filling. He says that the contract might be let early this year.

Other Structures.

ALLEGHENY, PA.—The Bradley Mfg. Co., of Pittsburgh, will build a foundry in Allegheny, the main building of which will be 100 x 300 ft. Armin Schotte, of Pittsburgh, is making the plans.

BUFFALO, N. Y.—In connection with the proposed union station in Buffalo, it is said that the New York Central will build a large hotel on the site of the present Mansion House, Exchange and Main streets.

CHICAGO, ILL.—The plant of the Marine Iron Works, which was recently destroyed by fire, will be entirely rebuilt.

DES MOINES, IOWA.—It is said that the Chicago, Milwaukee & St. Paul is considering building a freight house adjoining the Des Moines Union station in the spring. The company now occupies a portion of the freight house of the Des Moines Union, but is crowded for room.

DONORA, PA.—Within a few days contracts are to be let by the Union Steel Company for two blast furnaces, a group of open-hearth furnaces, and for steel structural work, which will cost several million dollars. The Mellons and H. C. Frick are interested in the concern.

GALVESTON, TEXAS.—The Southern Pacific Co., according to report, will build a freight depot in Galveston at a cost of about \$200,000. It will be at Twenty-ninth and Church streets.

GREENVILLE, PA.—It is said that the Bessemer & Lake Erie has begun work on the foundations of the new shops at Greenville. The first building to be erected will be the machine shop, which will be 120 x 128 ft., the work being done by the company's own force.

HARRISBURG, PA.—The Harrisburg Foundry & Machine Co. will build an addition to its present plant 160 x 50 ft., three stories high. Other improvements will also be made.

HOUSTON, TEXAS.—It is said that the Southern Pacific Co. intends to enlarge its shops in Houston at a cost of about \$60,000.

LEXINGTON, KY.—It is said that the Chesapeake & Ohio contemplates building a union station with the Louisville & Nashville in this city.

LINCOLN, NEB.—It is said that the Burlington road will build a new station in Lincoln.

NEW ORLEANS, LA.—Two new grain elevators are possibilities upon the property of the Illinois Central and the Yazoo & Mississippi Valley railroads in the vicinity of Stuyvesant docks.

NEWPORT, R. I.—The Newport & Fall River Street Ry. has decided to spend about \$300,000 on a power station in this city.

NEW YORK, N. Y.—A bill has been introduced in the House of Representatives at Washington to appropriate \$250,000 for a new post-office building in New York City. The bill provides that a commission consisting of the Secretary of the Treasury, the Postmaster General, the Postmaster of New York, the President of the New York Chamber of Commerce and the President of the New York Board of Trade and Transportation shall select the site for the building.

NORWALK, OHIO.—The Norwalk Steel & Iron Co. has been incorporated under the laws of Delaware, with \$1,000,000 capital stock. The plant which the company will build will be located in Norwalk, Ohio, and it is said contracts will soon be let.

NORWICH, N. Y.—The Delaware, Lackawanna & Western will build a new depot here.

PALESTINE, TEXAS.—The International & Great Northern contemplates spending \$33,575 on a new roundhouse in this place, and \$18,950 on a brick freight station.

PITTSBURGH, PA.—At a special meeting of the stockholders of the Westinghouse Machine Company, in Pittsburgh, Jan. 7, the capital stock was increased from \$3,000,000 to \$5,000,000 to provide additional working capital.

The Allegheny Steel & Iron Co. will increase its steel-making capacity by building another open-hearth furnace. The sheet rolling capacity will also be increased.

According to local report, the Panhandle R. R. will build a freight station adjoining the new passenger station.

POCATELLO, IDAHO.—The Oregon Short Line has awarded a contract to Grace & Hyde, of Chicago, for the structural iron work for the machine shop, blacksmith shop, boiler shop and a portion of the car shop and the 10-stall addition to the roundhouse for the new shop plant at Pocatello to cost about \$700,000. The amount to be spent during the next 12 months on this work will be about \$400,000. The Westinghouse Electric & Mfg. Co. has the contract for the electric cranes, transfer tables, etc., for these shops.

ST. LOUIS, MO.—It is reported that negotiations are in progress for building the proposed terminal in St. Louis.

SAN ANTONIO, TEXAS.—The International & Great Northern will spend \$55,000 this year on a new passenger station here, and \$18,000 on a brick roundhouse.

SIoux CITY, IOWA.—The train sheds of the Union Passenger Station, it is said, will be widened and extended. The Illinois Central freight house will be razed.

SOUTH HAVEN, MICH.—The Michigan Central will build a new station here.

TOLEDO, OHIO.—The Manufacturers' Railway, according to report, will build large coal and iron ore docks on the lower west bank of Maumee River. The docks will be about half a mile long and extend between Buffalo street and Michigan avenue.

WASHINGTON, D. C.—The Bureau of Yards & Docks, Navy Department, Washington, wants bids, until Jan. 11, 1 o'clock, p.m., for the steel work for a store house 40 x 98 ft.; estimated cost \$3,000.

WAYNE, ILL.—The Elgin, Aurora & Southern Traction Co., one of the Everett-Moore Syndicate properties, will build a large car plant in the western part of this town.

WORCESTER, MASS.—According to local report, the Boston & Albany has plans for a new station in this city.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page avii.)

National Association of Railroad Commissioners.

The next annual convention of the National Association of Railroad Commissioners will be held at Charleston, S. C., February 11.

Canadian Society of Civil Engineers.

At the ordinary meeting on Thursday, Jan. 2, at 8 p.m., Mr. H. D. Bush described the erection of the Interprovincial Bridge, Ottawa, with lanterns.

The Engineers' Club of Philadelphia.

A regular meeting was held on Saturday, Jan. 4, at 8 o'clock p.m. The paper was on "The Relation of the National Bureau of Standards to Engineering and Manufacturing Interests," by S. W. Stratton, Director, U. S. Bureau of Standards.

Western Railway Club.

At the next meeting of the Western Railway Club, Chicago, Jan. 21, two papers will be presented. The first will be "The Car Bolster Problem," by Mr. R. P. Lamont, Vice-President and Manager of the Simplex Railway Appliance Co., and the second, "The Proper Education for a Railroad Mechanical Engineer," by Prof. C. V. Kerr, of Armour Institute.

St. Louis Railway Club.

A meeting of the St. Louis Railway Club was held at the Southern Hotel, Friday afternoon, Jan. 10. Mr. Henry Miller, Assistant Superintendent of the Burlington Route, presented a paper, "Some truths about train tonnage," and a second paper, "What can we do to get trains over the road with more promptness?" was by Mr. E. McAuliffe, of the St. Louis & San Francisco.

New York Railroad Club.

The next meeting of the Club will be held at 349 Madison avenue, New York City, at 8 o'clock, p.m., Thursday of next week (Jan. 16). Mr. B. D. Caldwell, Traffic Manager of the Delaware, Lackawanna & Western R. R., will read a paper on "Community of Interest from a Traffic Standpoint." The new quarters of the club will accommodate comfortably a considerable number of people.

Southern and Southwestern Railway Club.

The next meeting of the Southern & Southwestern Railway Club will be held at the Kimball House, Atlanta, Ga., at 10 o'clock, a.m., Thursday, Jan. 16. Subjects for discussion: "Steam Heating versus Stoves, Cost to Maintain, etc." Committee J. R. Lane, L. B. Rhodes and W. E. Chester. "Locomotive Trackage,

the Best Modes of Keeping in Line, etc." "Painting Freight Cars; Spraying versus Hand and Cost of."

American Economic Association.

This Association, at the close of its annual meeting in Washington, D. C., elected the following officers: President, Prof. F. R. A. Seligman, of Columbia College, New York; Vice-Presidents, Profs. Theodore Marburg, of Baltimore; Fred M. Taylor, University of Michigan, and John C. Schwab, of Yale; Secretary and Treasurer, Prof. Frank A. Fetter, of Cornell University. A Committee on Publication was also selected, composed of the following members: Prof. J. H. Hollander, of Johns Hopkins University; Prof. T. C. Carver, of Harvard; Prof. D. K. Dewey, of the Massachusetts Institute of Technology; Prof. W. C. Fisher, of Wesleyan University; Prof. William A. Scott, of the University of Wisconsin, and Prof. Fred M. Taylor, of the University of Michigan.

American Institute of Mining Engineers.

The recent Mexican meeting of the Institute has involved an unusual amount of time and labor upon the part of the officers of the Institute, and still entails an extraordinary amount of publication and correspondence. It is consequently impracticable to organize another meeting for February next. The Council has, therefore, directed that the meeting of the Institute shall consist of a single, purely formal session, to be held on Feb. 18, 1902, at noon, in the office of the Secretary, 99 John street, New York City, for the purpose of counting ballots and the presentation of the Annual Report of the Council, which will be subsequently printed and distributed, as usual. The titles of all papers accepted will also be presented, and these papers will be printed and distributed for discussion at a later meeting, or adjourned meeting, as may be hereafter decided, which will take place in the spring at a time and place to be hereafter announced.

Railway Club of Pittsburgh.

The first number of the proceedings of the Railway Club of Pittsburgh has been published. It contains the minutes of the organizing meeting held on Nov. 15, and a list of the charter members; also the constitution and by-laws. It also has papers by Col. David P. Jones on "Some of the Underlying Causes for the Total Destruction of the Spanish Fleet at Santiago," and by J. E. Simons, of the Pittsburgh Coal Co., on "The Relation of the Young Man to Our Club." The officers of the Club for the year ending October, 1902, are: President, J. H. McConnell; Vice-President L. H. Turner; Treasurer, J. D. McIlwain; Secretary, J. D. Conway, and Executive Committee, D. F. Crawford, J. E. Simons, F. T. Hyndman. Meetings are held on the fourth Friday of each month except June, July and August. The December meeting was held on the 27th at 2 o'clock, p.m., at the Hotel Lincoln. The subject discussed was the "Steam Engine Indicator in Locomotive Practice."

American Society of Civil Engineers.

The forty-ninth annual meeting of the American Society of Civil Engineers will be held in New York City, Jan. 15 and 16. It will be called to order at 10 o'clock, on the morning of the 15th, when reports will be read, officers elected, and other business transacted. At 3 o'clock in the afternoon Mr. O'Rourke will describe his foundation work at the new Stock Exchange building, and the Hanover Bank building; and Mr. William Barclay Parsons will describe the progress of the work on the Rapid Transit Subway. In the evening of the 15th there will be a reception at the house of the society, with dancing. On Thursday the members are invited to inspect the Rapid Transit work with Mr. Parsons and other engineers. Mr. O'Rourke has asked the members to take luncheon with him at the new Stock Exchange building, where the foundations will be inspected after luncheon. In the evening there will be a smoker at the house of the society.

On Wednesday, Jan. 8, at 8:30 p.m., a paper by Elnathan Sweet, entitled "Some Important Phases of Canal Navigation, Illustrated by Recent Experiments in Germany," was presented for discussion. This paper was printed in the December number of the Proceedings.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. E. L. Bond, President of the Phillipsburg Railway & Quarry Company, was recently burned to death at his country house near Montreal.

—Mr. James Mooney died at Brockville, Ont., recently. He was at the time of his death General Passenger Agent of the Brockville, Westport & Sault Ste. Marie.

—Herr Zemp, for 10 years at the head of the Swiss government railroad department, has been chosen President of the Swiss confederacy for 1902. He held the position in 1895 also.

—Mr. James S. MacKie, Vice-President of the Mexican International, died Dec. 29, of apoplexy, aged 78 years. Mr. MacKie was a graduate of Union College and served through the Civil War.

—The new Superintendent of Car Service of the Delaware & Hudson Company, Mr. G. A. Keller, was born at Poughkeepsie, N. Y., Nov. 1, 1856, and entered railroad service with this company, then known as the Delaware & Hudson Canal Company, in June, 1881, as record clerk; about three years later he was made millage clerk and in 1887 was appointed Car Accountant. Mr. Keller assumed his new duties Jan. 1, 1902.

—Mr. E. W. Farnham, who has been connected with the Chicago, Burlington & Quincy for the past 11 years in various positions, latterly as Superintendent of Car and Special Freight Service, recently became President and General Manager of the Rapid Transit Construction Company, of Chicago, Ill. It is understood that this company is directly interested in the placing of what is known as the Farnham Electric Power Feeder for use in high-speed electrical traction.

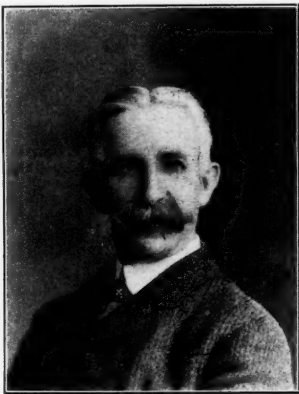
—Mr. M. L. Byers, who was recently appointed Engineer Maintenance of Way of the Baltimore & Ohio, is 34 years old, having been born in 1868. He was graduated from the Lehigh University in 1888 and the same year became Assistant Engineer Maintenance of Way of the Erie and Ashtabula Division of the Pennsylvania Company. Four years later he held a similar position on the Indianapolis Division of the Pittsburgh, Cincinnati, Chicago & St. Louis. In April, 1894, he became attached to the office of the Chief Engineer of the same company and four months later became Engineer Maintenance of Way of the Cincinnati & Muskingum Valley Division. The following year he was transferred to the Indianapolis Division and from then, until February,

1901, was on the Chicago Division in the same capacity. From August 1 up to the time of his recent appointment, Mr. Byers was Assistant Manager of the erecting department of the American Bridge Company.

—Col. Charles B. Lamborn, who died in New York, Jan. 3, was born in Kennett Square, Pa., in 1837. He graduated in 1859 at the University of Michigan, served during the war, for a time on the staff of Gen. John F. Reynolds, and rose to be lieutenant-colonel of the Fifteenth Pennsylvania Cavalry. After the war he and his brother, the late Dr. Robert H. Lamborn, were engaged in several railroad and other enterprises in Kansas and Colorado, usually in connection with Gen. Wm. J. Palmer. Col. Lamborn was Secretary of the Kansas Pacific Railway Co. during a portion of the period of its construction; after 1870 he was with land and railroad enterprises in Colorado, and in 1882 was appointed Land Commissioner of the Northern Pacific Railroad, serving as such until 1893, a period of extraordinary activity in the land business of the company, whose future prosperity depended largely on the sale and the settlement of the immense areas of land along its line. Col. Lamborn leaves a widow, the sister of Bayard Taylor (whose brother was with Lamborn in college) and two daughters.

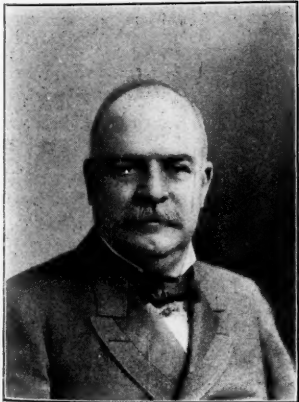
—Mr. Richard L. O'Donnell was born in Philadelphia, Nov. 5, 1860. Was graduated from the Philadelphia High School in 1877, and from the Polytechnic College of Pennsylvania in 1882. He spent 1882 and 1883 as a rodman in the construction of the Cornwall & Lebanon Railroad. In the last named year (1883) he entered the service of the Pennsylvania Railroad, where, in various offices and locations, he has since been continuously. He was employed as a rodman, levelman and transitman in the construction department, 1883 and 1884; as draughtsman at Blairsville in the Assistant Engineer's office of the West Pennsylvania Division during 1884-6, and from November, 1886, until March, 1887, as Assistant Engineer in the Principal Engineer's office at Altoona. He was appointed Assistant Supervisor on the Altoona Division at Hollidaysburg in March, 1887, in which position he continued until February, 1888, being then transferred to the same official post at Lancaster, on the Philadelphia Division. In 1889, after three weeks' duty on the Pittsburgh Division at Johnstown, Mr. O'Donnell was transferred a second time as Assistant Supervisor to New Florence, from which position he was promoted in November, 1889, to that of Supervisor in Altoona yard. In April, 1891, he was promoted to Assistant Engineer of Tyrone Division, continuing at that point until December, 1894, when he was transferred to Assistant Engineer of the Pittsburgh Division. In February, 1897, Mr. O'Donnell was appointed Assistant Superintendent of the Pittsburgh Division, from which position he was promoted to that of General Agent and Superintendent of the Pittsburgh Division.

—Mr. Arthur Burr Starr has been made General Superintendent of Freight Transportation, Pennsylvania Lines West of Pittsburgh, taking over a large part of the duties of Mr.



he held until Nov. 1, 1899, when he became Assistant General Superintendent of Transportation of the Pennsylvania Lines West of Pittsburgh.

—Mr. Robert Pitcairn has been made Resident Assistant to the President of the Pennsylvania Railroad Company, in Pittsburgh. Mr. Pitcairn has had a very remarkable career in that for almost 37 years he has held one office, namely, that of Superintendent of the Pittsburgh Division of the Pennsylvania Railroad. For about 27 years he has been General Agent as well as Division Superintendent. It is pretty well understood that Mr. Pitcairn might long ago have taken any one of half a dozen positions on the Pennsylvania Railroad, or elsewhere, if he had chosen to do so, but he has preferred to remain as Division Superintendent.



Transportation; and April 1, 1895, became Superintendent of the Pittsburgh Division. This division, of which Andrew Carnegie was at one time Superintendent, is known throughout the country by its "old-timers" association, an organization of officers and employees who have been long in the service, which holds an annual reunion. Mr. Pitcairn is the leading spirit in this association. He is also prominent in the American Railway Association. He has been a member of the train-rules committee of that association since the days of the Time Convention, and Chairman of it for the past 10 years. The work of this committee is well known to our readers. Only by the quantity of old and imperfect rules that have been buried in oblivion in consequence of the introduc-

tion of the standard code, framed by this committee (if we could measure it) would it be possible to measure the value of the simplicity and system that have been introduced into railroad rules by the arduous labors of this committee. As will be seen by his portrait, Mr. Pitcairn is not anywhere near 66 years old; and his very numerous friends will wish him much happiness in his new position.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—A. Stevenson, Assistant General Freight Agent, with headquarters at Philadelphia, Pa., has resigned and the position has been abolished.

Baltimore & Ohio Southwestern.—E. Hart, Jr., heretofore General Agent, freight department, has been appointed Assistant General Freight Agent, with headquarters at St. Louis.

Burlington & Missouri River in Nebraska.—G. W. Rhodes, Assistant General Superintendent, has been appointed Acting Superintendent of Motive Power.

Burlington, Cedar Rapids & Northern.—W. J. Morrison, Purchasing Agent, has resigned.

Central Florida & Gulf Coast.—T. A. Allen, heretofore Chief Engineer of the Delaware Valley, has been appointed Chief Engineer of the C. F. & G. C., which is now under construction. Mr. Allen's headquarters will be at Plant City, Fla.

Central of Georgia.—F. J. Robinson has been appointed Assistant General Passenger Agent, with headquarters at Savannah, Ga.

Chicago & Alton.—C. M. Mendenhall, Superintendent of Motive Power, with headquarters at Bloomington, Ill., has resigned, effective Feb. 1.

E. V. Dexter has been appointed Fuel Agent.

Chicago, Burlington & Quincy.—W. L. Barnes has been appointed Superintendent of Car and Special Freight Service, succeeding E. W. Farnham, resigned.

Chicago Terminal Transfer.—J. W. Fogg, heretofore Acting Master Mechanic, has been appointed Master Mechanic.

Choctaw, Oklahoma & Gulf.—A. H. McDonald has been appointed Assistant General Freight Agent, with headquarters at Little Rock, Ark.

Colorado Midland.—F. D. Hunter, heretofore Assistant General Freight Agent, and C. H. Speers, Assistant General Passenger Agent, have been appointed General Freight and General Passenger Agents, respectively.

Delaware, Lackawanna & Western.—S. W. Hayes, heretofore Division Engineer of the New York Central & Hudson River, has been appointed Engineer of Track Elevation of the D., L. & W., with headquarters at Newark, N. J.

Denver & Rio Grande.—C. Lydon, Fourth Division Superintendent, has been granted leave of absence and F. S. Harris, Assistant Superintendent, is Acting Superintendent during Mr. Lydon's absence. The jurisdiction of C. A. Parker, Superintendent of Telegraph of the D. & R. G., has been extended over the Rio Grande Western. Thomas Tipton, heretofore Acting Purchasing Agent, will be made Purchasing Agent.

Detroit Southern.—J. W. Sherwood has been appointed General Superintendent, with headquarters at Detroit. Frank Ferris, General Freight Agent, having resigned, H. A. Fidler, Division Freight Agent, will have charge of the freight traffic department (temporarily) with headquarters in Detroit.

Dunkirk, Allegheny Valley & Pittsburgh.—W. Sprague has been appointed Chief Engineer.

Eastern of Minnesota.—W. W. Broughton, heretofore Assistant General Freight Agent of the Northern Pacific, has been appointed Traffic Manager of the E. of M., succeeding J. C. Eden. (See Great Northern.)

Erie.—J. Corbett, heretofore Assistant Superintendent of the Chicago & Erie, has been appointed Acting Division Superintendent of the Erie, succeeding the late G. A. Coe.

Great Northern.—At a meeting of the directors of this company the executive staff was reorganized as follows: First Vice-President, J. N. Hill; Second Vice-President, R. I. Farrington; Third Vice-President, E. T. Nichols; and Fourth Vice-President, J. W. Blabon.

J. C. Eden, heretofore Traffic Manager of the Eastern of Minnesota, has been appointed Western Freight Manager of the G. N., succeeding J. W. Blabon.

Gulf & Ship Island.—At a meeting of the Directors, held recently, the following new Directors were elected: Charles K. Beekman, Emerson W. Judd and Clarence S. McClellan.

Gulf, Colorado & Santa Fe.—W. C. Nixon, heretofore General Superintendent, has been appointed General Manager, succeeding L. J. Polk, who has been elected Vice-President.

Houston & Texas Central.—C. H. Markham, heretofore Assistant Freight Traffic Manager of the Southern Pacific, has been elected Vice-President of the H. & T. C.

A. V. Kellogg has been appointed Engineer Maintenance of Way, succeeding W. G. Howe, resigned.

Lake Erie & Western.—H. F. Bickell, heretofore Assistant General Superintendent, has been appointed Division Superintendent, succeeding J. B. Thomas, resigned. The position held by Mr. Bickell has been abolished.

Little Kanawha.—H. G. Lampman has been appointed Traffic Manager.

Long Island.—C. L. Addison has been appointed Superintendent of Transportation, succeeding L. P. Pairo, resigned, effective Jan. 6.

Louisville & Nashville.—B. M. Starks, heretofore Superintendent of Terminals at Nashville, Tenn., has been appointed Superintendent of the South & North Alabama and Birmingham Mineral Divisions of the L. & N., with headquarters at Birmingham, Ala., succeeding J. L. Welch, resigned.

W. P. Bruce has been appointed Acting Superintendent of Terminals.

Minneapolis & St. Louis.—M. Sweeney, heretofore General Superintendent of the Missouri, Kansas & Texas, has been appointed General Superintendent of the M. & St. L., with headquarters at Minneapolis, Minn.

Missouri, Kansas & Texas.—M. Sweeney, General Superintendent, has resigned. (See Minneapolis & St. Louis.)

Northern Pacific.—R. P. Blake has been appointed Mechanical Engineer, with headquarters at St. Paul, Minn.

Oregon R. R. & Navigation Company.—See Union Pacific.

Oregon Short Line.—See Union Pacific.

Pennsylvania Company.—S. C. Scott has been appointed Assistant to the First Vice-President. The offices of General Superintendent of Transportation and Assistant General Superintendent of Transportation have been abolished, and the offices of General Superintendent of Freight Transportation, and General Superintendent of Passenger Transportation have been created. A. B. Starr, heretofore Assistant General Superintendent of Transportation, has been appointed General Superintendent of Freight Transportation, and Charles Watts, heretofore General Superintendent (Northwest System) becomes General Superintendent of Passenger Transportation. A. M. Schoyer, heretofore Superintendent of the Eastern Division (Northwest System) succeeds Mr. Watts, as General Superintendent (Northwest System), and R. E. McCarty, heretofore Trainmaster (Southwest Division) becomes Superintendent of the Pittsburgh Division, same system, to succeed Mr. Cushing.

Philadelphia & Reading.—G. C. Thompson has been appointed Auditor of Coal Traffic, succeeding the late Mr. Hancock.

Republic & Grand Forks.—T. Birbeck has been appointed General Freight and Passenger Agent, with headquarters at Grand Forks, B. C.

Southern Pacific.—See Union Pacific.

Texas Southern.—E. B. Couch, Auditor, with headquarters at Marshall, Texas, has resigned.

Toledo, St. Louis & Western.—J. L. Frazier, heretofore Division Superintendent of the Northern Pacific (Pacific System), is to become General Superintendent of the T., St. L. & W.

Union Pacific.—W. Mahl, heretofore Comptroller of the Southern Pacific, and H. S. Bradt, Assistant Secretary of the U. P., have been appointed respectively Comptroller and Assistant Comptroller of the U. P. The jurisdiction of Erastus Young, General Auditor, has been extended over the Southern Pacific, Oregon Short Line and the Oregon R. R. & Navigation Company.

West Virginia Central & Pittsburgh.—J. G. Kalbaugh has been appointed Superintendent of Motive Power, succeeding D. C. Courtney, resigned.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARKANSAS WESTERN.—The line between Heavener, Ind. T., and Waldron, Ark., 32 miles, is reported completed and it is said that work has been begun on an extension from Waldron to Hot Springs, Ark., a distance of 82 miles.

BALTIMORE & OHIO.—Surveys are reported for a new route between Martinsburg and Harpers Ferry, leaving the main line of the B. & O. six miles west of Martinsburg. The survey then goes southeast and cuts through Shepardstown, W. Va., Leeland and other small towns with the intention of striking the Potomac River at the old Knot Quarters and following the river until the main line is reached, a mile west of Harpers Ferry. The length of the new line will be about 20 miles, which is practically the same as the present route, but a number of serious grades will be eliminated. At present it is necessary to use helper engines on this stretch.

CANADA CENTRAL.—Application is to be made at the next session of the Dominion Parliament for a railroad to commence at the mouth of the French River, Lake Huron, and run through Ontario and Manitoba to Lake Winnipeg, and thence northwest by way of Prince Albert and Edmonton, in Alberta, to Tete Jaune Cache, B. C., and thence south and west to Vancouver by way of Kamloops and Princeton, with branches.

CANADIAN NORTHERN.—The completion of the line from Port Arthur, Ont., to Winnipeg, Man., was celebrated Dec. 30. This is a part of the new route between Quebec and Fort Simpson, on the Pacific. (Dec. 6, 1901, p. 849.)

CAPE BRETON EXTENSION.—Contract is reported let to Lackie & Collins for 50 miles more of its new line in Nova Scotia at an estimated cost of about \$30,000 a mile. (Dec. 6, p. 850.)

CENTRAL NEW ENGLAND.—The legal dispute between this company and the New York, New Haven & Hartford has been re-opened. At last reports the New Haven road has ceased opposition to the plan to build a loop around the so-called Montague farm. The Central New England, however, has brought the case up anew for condemnation of a strip across the 400-ft. piece of property and the matter is being contested by the N. Y., N. H. & H. The case has been adjourned until Nov. 11. (Dec. 27, p. 900.)

CHICAGO & NORTH WESTERN.—It is said that the company will begin work early in the spring on an extension of its line from Princeton, Wis., to Elroy, 40 miles distant. Surveys are practically completed and rights of way have been secured. It is said that the new line will be primarily a coal road to afford a western through line from Lake Michigan. (Construction Supplement, Oct. 11, 1901.)

Contract for the extension between Deadwood and Lead, S. Dak., has been let to W. H. Dacy and P. J. McHugh, of Deadwood. The contract requires completion of the work by March 1.

CHICAGO, ROCK ISLAND & PACIFIC.—Notice has been filed with the Territorial Secretary at Guthrie, Okla. T., of intention to extend the line from Anadarko, Okla. T., to a point on the main line near Addington, Ind. T., a distance of 76 miles. The Rock Island has at present in operation a line south from Anadarko towards Fort Sill, which was reported running for a distance of 22 miles last October, and this is presumably a continuation of the same.

CINCINNATI, RICHMOND & MUNCIE.—It is stated that this line is to be completed on Feb. 10, at which date the first through train will pass between Cincinnati and Chicago. There remains 17 miles of track to be built

between Peru and North Judson, Ind. Between Cincinnati and Cottage Grove the tracks of the Cincinnati, Hamilton & Dayton will be used, and between North Judson and Chicago cars will be operated over the Indiana, Illinois & Iowa and Chicago Belt Line. (Construction Supplement, Oct. 11, 1901.)

EUREKA & KLAMATH RIVER.—This company is said to have five miles of new line building at the present time and it is thought that about this much more will be ready to let about the middle of February. C. W. Root, Eureka, Cal., Chief Engineer. (Construction Supplement, Oct. 11, 1901.)

GEORGIA NORTHERN.—It is said that work will begin at once on this company's extension from their present terminus at Carlisle, Ga., to Albany, which is 20 miles northwest. Rails have been purchased and are on the way. The work is under the supervision of C. W. Pidcock, General Manager of the line, and J. N. Pidcock. It is the intention of the company to inaugurate a fast double passenger service daily between Moultrie and Albany, on the completion of the line.

GEORGIA ROADS.—The new line between Hagin and Register, Ga., 18 miles, which is being built by the Perkins Lumber Co., has been completed and, with the 22 miles now in operation between Glennville and Hagin, gives a through line 40 miles long. (Oct. 25, p. 746.)

GREAT NORTHERN.—Contract has been let to O'Hern & Williams for the Garneau cut-off on the Great Northern line between Montreal and Quebec. The distance between Quebec and Garneau Junction is about 58 miles, and 17 miles will be saved by the cut-off. The clearing is to be done this winter and rock work started probably this month. Work is to be completed by next November. (Nov. 8, p. 782.)

GRAND RAPIDS, KALAMAZOO & SOUTH HAVEN TRACTION.—Contract for building this new electric line in Michigan, which will operate a total of over 150 miles, has been let to the Equitable Construction Co., of Allegan, Mich., and Philadelphia, Pa., and work is to be begun early this year. J. J. Patterson, of Philadelphia, is President. (Oct. 18, 1901, p. 730.)

GRAND TRUNK OF CANADA.—It is reported that the line is to be double-tracked between Chicago and Port Huron, 335 miles, and between Hamilton and Niagara Falls, at a cost of \$3,000,000. Work has been in progress for some time on the section between Hamilton and Niagara Falls. (Construction Supplement, Oct. 11, 1901.)

INDIANAPOLIS, NASHVILLE & SOUTHERN.—It is stated in the articles of incorporation of this road, reported last week as a steam road, that it may be operated by electricity or other power. B. F. Nysewander, Indianapolis, Ind., is interested. (Jan. 3, p. 14.)

INTERNATIONAL & GREAT NORTHERN.—An itemized statement of proposed expenditures for betterments to be made during 1902 has been filed with the Texas Railroad Commission and makes a total of \$587,935. Among the larger items are \$26,564 for drain pipes and stone culverts; \$70,000 for renewing the long span of the Brazos River bridge; \$40,000 for storage and supply tanks for fuel oil, and \$55,000 for a new passenger depot at San Antonio. Large amounts are also to be spent in reducing the grade, raising embankments, ballasting, etc.

It is reported on good authority that the company has definitely decided to build a line from Dallas to Corsicana, Texas, which is about 85 miles, and would parallel the Southern Pacific between these points. Preliminary surveys are to be made some time this month.

LOUISVILLE & NASHVILLE.—The Long Branch Coal Co., chartered by the Secretary of State in Alabama, Dec. 19, is to be a branch of the above company, and authority has been given to extend the line further north from the original seven miles contemplated. The directors are M. H. Smith, H. W. Bruce, J. H. Ellis, W. W. Thompson and J. H. Ringold, of Louisville, and J. M. Faulkner and G. W. Jones, of Montgomery, Ala. (Nov. 22, 1901, p. 816.)

MARINETTE, TOMAHAWK & WESTERN.—It is reported that this company, which operates a standard gage line between Tomahawk and Harrison, Wis., 14 miles, to Tomahawk Junction, 5½ miles, and Jersey City, Wis., to Spirit Falls, 13½ miles, a total mileage of 33, is at work on an extension 12 miles east from Gleason, Wis. The line was originally opened in 1895, and purchased the Wisconsin & Chippewa in 1898.

MEXICAN CENTRAL.—Surveys are reported completed for the new line to be built between Aguas Calientes and Guadalajara, Mexico, and it is said that work will begin soon. The building of this road will shorten the distance between the two cities 150 miles, as compared with the present route, and will constitute an important link in the new through line of the Mexican Central between the port of Manzanillo, on the Pacific, and Tampico, on the Atlantic coast of Mexico.

MIDLAND OF NOVA SCOTIA.—Surveys are reported completed of the route for this proposed line in Nova Scotia between Truro and Windsor, 58 miles. The surveys are in the interest of the Provincial and Dominion governments.

MINNEAPOLIS & ST. LOUIS.—It is said that this company will rebuild its track between Fort Dodge and Angus, Iowa, 48 miles, next spring, and will spend about \$75,000 in Fort Dodge on enlargements and improvements of its freight yards. A new line is also to be built from the south end of Kalo bridge across the Des Moines River to a junction with the present line near Burnside, and the portion of the road between these two points now in use will be abandoned. By this change the maximum grade from the river to the prairie will be reduced to 28 ft. to the mile. The present maximum grade between these points is about 84 ft. to the mile.

MISSOURI, KANSAS & OKLAHOMA.—This is the corporate name of the company reported last week under the name of Missouri, Kansas & Texas, as having filed a charter at Guthrie to build three important lines in Oklahoma and Indian Territory. The incorporators are: P. N. Finney, of Milwaukee; James Hagerman, of St. Louis; W. Van Riper, of New York, and others. (Jan. 3, p. 14.)

MISSOURI, KANSAS & TEXAS.—An officer denies the current reports that the projected line between Omaha and Emporia, Kan., has any connection with the Missouri, Kansas & Texas line.

NACAZARI.—An officer writes that 55.8 miles of new line have been laid during 1901 out of Agua Prieta, by Robinson & Toohy and A. T. Douglas, contractors, and that surveys have been made through to Nacozari, 18½ miles beyond, but that this part of the line is not yet under contract. S. P. Hutchinson, 99 John street, New York, is Second Vice-President and General Manager.

NIPISSING & OTTAWA.—Application is being made to the Dominion Parliament for an act to incorporate a company to build from a point on Southeast Bay, at the east end of Lake Nipissing, northeasterly to a point on Trout Lake, and thence through the townships of Phelps and French to a point on the Ottawa River at or near the Opemicon River.

NORFOLK & WESTERN.—Bids have been received for rebuilding the line between Delano, which is near Chillicothe, Ohio, and Kingston, 11 miles distant. The object of the work is to take out several curves and also to shorten the line.

OKLAHOMA & TEXAS SOUTHERN.—Charter for this company was filed at Austin, Texas, Dec. 31. The company has a capital stock of \$125,000 and is formed to build a railroad from Spanish Fort, on the Red River in Montague County, Texas, south to Weatherford, Texas, 125 miles distant, by way of Montague and Bowie. The general office of the company is at Montague. The incorporators are T. L. Garrison and John P. Slaten, of Montague; D. H. Bates, of Henrietta, Texas, and others. W. A. Squires, of Henrietta, is President, and McKeon Johnstone, Chief Engineer.

OKLAHOMA CITY & TEXAS.—Charter for this company was filed at Austin, on Dec. 26, with a capital stock of \$500,000. The principal office is at Quanah, Texas, and the company's object is to build a railroad from a point on the Red River in Hardeman County, Texas, from a connection with the Oklahoma City & Western, seven miles south to Quanah; also a branch line from a point 1½ miles south of the Red River to Acme, Texas, seven miles. The incorporators are C. G. Jones and D. C. Lewis, of Oklahoma City, and others.

ORANGE & NORTHWESTERN.—An officer writes that the company has laid 36 miles of new track during the year in Texas, and that 345 miles more are projected.

PITTSBURGH, SHAWMUT & NORTHERN.—An officer writes that the widening to standard gage of the line between Olean and Bolivar, N. Y., 18 miles, was completed Dec. 29, 1901. (Construction Supplement, Oct. 11, 1901.)

RUTLAND.—W. Seward Webb, President Clement and S. R. Callaway have been appointed a committee to carry out extensive changes and improvements all along the line. The work is said to involve new ballast, heavier rails, new steel bridges, new stations and remodeling the yards at a number of junction points.

SAGINAW SUBURBAN (ELECTRIC).—An officer writes that this proposed electric line between Bay City and Flint, Mich., by way of Saginaw, is expected to be in operation next July, although none of the line is at present finished. The total distance will be about 50 miles and it is planned to carry both freight and passengers.

SAN PEDRO, LOS ANGELES & SALT LAKE.—Application has been filed at Los Angeles for permission to build a line across the Forest Reserve through Cajon Pass near San Bernardino, Cal. This is the first definite announcement as to the route to be used in getting over the mountains out of Southern California.

SEGUIN & NORTHWESTERN.—The company has filed a charter at Austin, Texas, with a capital stock of \$100,000, to build a railroad from Seguin, on the line of the Southern Pacific, through a part of Guadalupe and Comal counties, to a point on the International & Great Northern, or the Missouri, Kansas & Texas, or to the intersection of these two roads. The northwestern terminus of the proposed road is to be at some point between New Braunfels and San Marcos, Texas, and the principal office of the company will be at Seguin. It is said that a greater part of the necessary funds for building have already been secured. The incorporators are C. E. Tips, T. H. Baker and others, of Seguin.

VENTURA & OJAI VALLEY.—This California railroad, 16 miles long, which extends from Ventura to Nordhoff, and is at present operated by the Southern Pacific, has been bought from them by California parties, and it is said that it may be extended to Santa Paula, 10 miles southeast of Nordhoff. The road was completed by Capt. John Cross, of Los Angeles, several years ago and later turned over by him to the Southern Pacific. The purchasers are Wm. R. Statts Co., H. L. Van Schaick and others of Pasadena, and George C. Power and W. H. Post, of Ventura.

WABASH RIVER TRACTION.—A mortgage has been filed by this company covering this entire property to secure 5 per cent. 30-year bonds, the purpose of which is to raise money to extend the line from Peru, Ind., to Logansport. It is at present in operation between Peru and Wabash, 18 miles, and the proposed extension is 17 miles long.

GENERAL RAILROAD NEWS.

BANGOR & AROOSTOOK.—Brown Bros., of New York, and Lee, Higginson & Co., of Boston, offer the unsold balance of \$1,900,000 consolidated refunding mortgage 4 per cent. 50-year gold bonds of last July. A statement by the company says that the outlook for the present fiscal year is that gross earnings will be at least \$1,575,000, or about \$4,300 per mile of road, and that net earnings will be at least \$580,000.

BARCLAY.—This railroad, extending between Towanda and Barclay, Bradford County, Pa., a distance of 18 miles, has suffered serious damage from recent floods, and the stockholders are now considering various plans for rebuilding. In accordance with one of these by which the stockholders will be assessed \$25 a share in return for bonds authorized several years ago, but not then negotiated, it is proposed to raise \$500,000, which will provide also for an extension from Barclay to Canton, on the Northern Central, Bradford County, 20 miles distant.

CHICAGO, BURLINGTON & QUINCY.—Sealed proposals will be received, until Jan. 15, at the company's office in Boston, Mass., for the sale of the Denver Extension 1922 4 per cent. bonds to the extent of \$90,911.96 reserved for that purpose. Proposals will be opened Jan. 15, and interest on the accepted bonds will cease on the following day.

CHICAGO & NORTH WESTERN.—It is announced that this company has taken over the Chicago, Iowa & Dakota, extending between Eldora Junction and Alden, Iowa, 26 miles. This line had for some time served as a feeder to the Chicago & North Western, with which it had a traffic arrangement.

DETROIT UNITED.—The Everett-Moore Syndicate controlling a large number of trolley lines in the northern part of Ohio and the southern part of Michigan, has

been compelled to turn its properties over to a committee of its creditors. At a recent meeting of the creditors it was voted to extend the indebtedness of the Syndicate and its allied interests for a period of not exceeding 18 months, conditioned upon the committee named having full charge of all the Syndicate's affairs, and papers looking towards such extension have been executed by the members of the Everett-Moore Syndicate and are now being executed as rapidly as possible by the Cleveland banks.

GULF & BRAZOS VALLEY.—This company, which is at present in operation between Peck City and Mineral Wells, Texas, 10½ miles, was sold at auction on Jan. 7. The line was projected between Eagle Pass, Texas, and Chandler, Okla. T., with branches, and has work in progress on an extension between Mineral Wells and Jackboro, 31 miles. Its rolling stock consists of two locomotives and one car.

INTEROCEANIC OF MEXICO.—This company has purchased the San Marcos & Tecoluta, which is about 75 miles long, running between San Marcos and Tezuitlan. The road was built by F. Martel under a concession by the Mexican Government, and will be operated as a branch line of the Interoceanic.

LAKE SHORE & MICHIGAN SOUTHERN.—This company has bought the Indiana, Illinois & Iowa by the purchase of a large majority of its capital stock. It is said that at the next meeting of the directors of the New York Central & Hudson River additional stock to the extent of \$20,000,000 is to be authorized which is to be used in part for payment of this property. The management of the Indiana, Illinois & Iowa is to go to the General Manager of the Lake Shore System. Three hundred and six miles of line are operated at present by this company between South Bend, Ind., and Seatonville, Ill., with a line to St. Joseph and Benton Harbor, Mich.

MICHIGAN CENTRAL.—Papers were filed with the Secretary of State of Michigan, Dec. 30, whereby the Michigan Central relinquishes its special charter and re-incorporates under the general railroad law of the State in accordance with an act passed last year by the Legislature. It is said that the company is to institute legal proceedings for damages suffered through the loss of its special charter. In the articles of re-incorporation the company's capital is placed at \$18,738,000. (Sept. 27, 1901, p. 676.)

NORFOLK & WESTERN.—This company closed arrangements for possession of the West Virginia coal fields of the Pocahontas Coal & Coke Co., on Jan. 2. Four per cent. bonds are to be issued to cover the cost, and the Pennsylvania R. R. guarantees against any deficit caused by the acquisition of the coal lands. The United States Steel Corporation also figures in the arrangement, as it has leased 50,000 acres owned by the Pocahontas Company, on royalties. It is said that the steel company will operate coke ovens in the Pocahontas territory. By this purchase the Norfolk & Western comes into possession of approximately 300,000 acres of coal.

NORTHERN PACIFIC.—Following the removal of the injunction decreed on Dec. 30 by Judge Elliott, the Northern Pacific advertises that the preferred stock was retired in whole upon Jan. 1, 1902, and the holders of preferred stock certificates not yet surrendered are notified that they may receive per payment by presenting their holdings at the company's office in New York. Notice is also given of 4 per cent. convertible certificates, dated Nov. 15, 1901, that the company requires these certificates to be converted into common stock at the rate of one share of \$100 for each \$100 of unpaid principal, no interest to accrue or be payable on any such certificate after January, 1902. (Jan. 3, p. 14.)

PENNSYLVANIA.—The earnings of the lines directly operated for the 11 months ending Nov. 30, show an increase of \$7,734,000 over the same period last year, and after deducting \$3,370,200 increased expenses, there remains a net increase of \$4,363,800. The Lines West show an increase in gross earnings of \$5,196,100 during the same period, and an increase of net earnings of \$2,554,900, and the Philadelphia, Wilmington & Baltimore, the Northern Central and the West Jersey & Seashore also show increases. During the month of November alone, however, the net earnings on all the lines east of Pittsburgh and Erie decreased from the figure in November, 1900. The decrease on the lines directly operated amounted to \$16,800; on the P., W. & B., to \$3,700; on the Northern Central, to \$60,300, and on the W. J. & S., \$7,300.

QUEBEC SOUTHERN.—Notice is given that a meeting of the shareholders will be held in Montreal, Jan. 14, to effect an agreement of amalgamation between the Quebec Southern and the South Shore; to sanction the increase of capital stock from \$1,000,000 to \$4,000,000; to authorize the directors to issue bonds not to exceed \$30,000 per mile, convertible into preference stock and otherwise as may be decided on by the directors, said bonds to be secured by mortgage and pledge on the company's property, present and future, in such manner as may be decided upon, and to authorize the directors to execute such trust deed as may be advisable, containing such terms and stipulations respecting interest, security, etc., as may be considered in the interest of the company.

SUFFOLK & CAROLINA.—An officer writes that a bond issue is contemplated to cover the cost of extension to Edenton, N. C., and of various betterments. Eleven miles of track still remain to be laid on the 17-mile extension which was started from Ryland Station, N. C., and is completed beyond Center Hill. The grading, track laying and bridging is being done by the company. (Construction Supplement, Oct. 11, 1901.)

SOUTHERN PACIFIC.—Notice is given that the Central Pacific has set apart from its net income \$25,000 to redeem the 3½ per cent. bonds of the mortgage made to the United States Trust Co., in 1899, and bids are invited for the surrender of such bonds. They must be sent in on or before Jan. 31, 1902; \$25,000 has also been set apart to redeem the first refunding mortgage bonds of 1899 and bids are similarly invited.

ULSTER & DELAWARE.—An agreement of consolidation was filed at Albany, N. Y., Dec. 31, in accordance with which the Ulster & Delaware, Delaware & Otsego, Stony Clove & Catskill Mountain, Hobart Branch and Kaaterskill railroads consolidated under the above name. The total mileage of these lines is about 110 and they have previously been operated by the Ulster & Delaware under lease. The new company has a capital of \$3,000,000, and S. D. Coykendall, of Rondout, N. Y., is President.